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The Welding Engineer

AUGUST, 1945

THE PIONEER TECHNICAL PUBLICATION OF THE WELDING INDUSTRY

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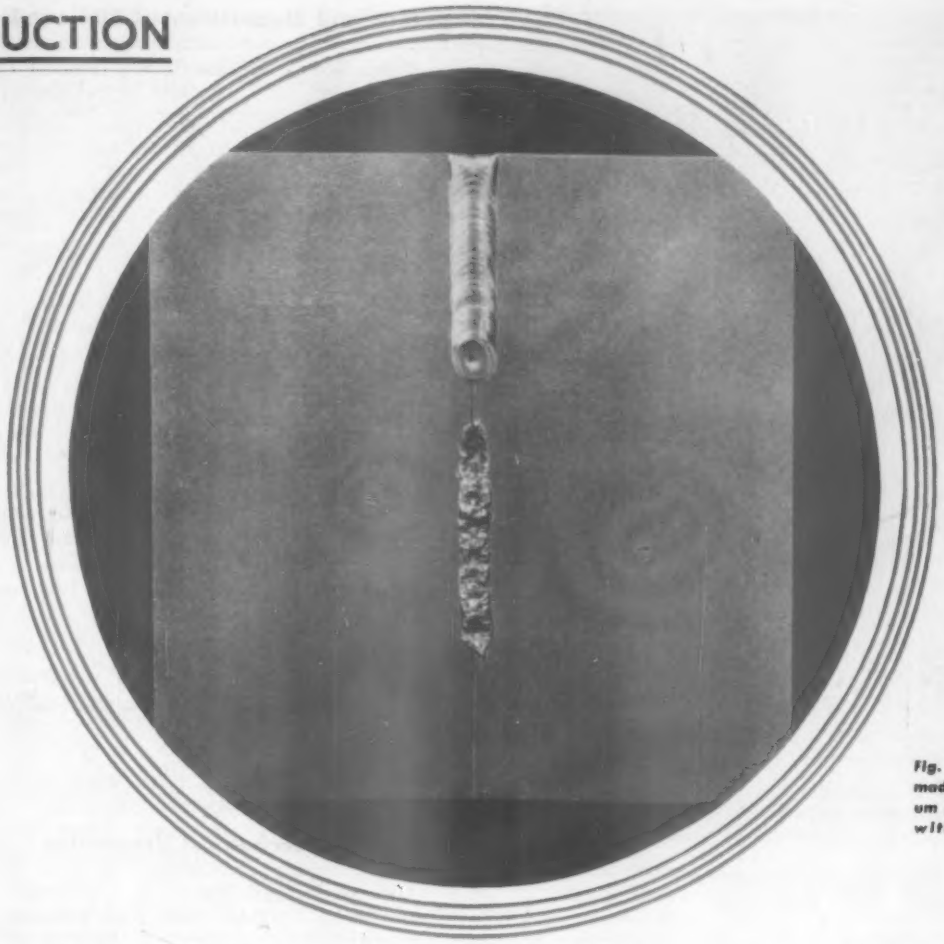

Fig. 1—Arc welds made in magnesium plate with and without helium.

Heliarc Welding at Northrop

The successful arc welding of magnesium alloys makes it possible to revolutionize aircraft design. Full details of this important development after several years' trial are given by Mr. Masdeo in this comprehensive summary.

By **F. MASDEO**
Welding Engineer,
Northrop Aircraft, Inc.

THE Heliarc process of fusion welding is the end result of vast research done in the effort to obtain a satisfactory method of arc welding magnesium alloys. This process has made revolutionary changes possible in the design of aircraft structures. Before its advent, gas welding by the oxy-acetylene or oxy-hydrogen process was generally used. Gas welding, however, had to be limited to butt joints because the flux used was of a highly corrosive nature and was likely to cause corrosion if entrapped in the weld or between the faying surfaces of a lap weld.

Gas-Shielded Arc

In the Heliarc welding process the results are made possible by using an inert gas such as helium or argon to shield the arc between the tungsten electrode and the work. The arc melts the material to be welded, and the inert gas prevents oxidation of the weld metal. No flux is required during Heliarc welding, and as a result all types of joints commonly used on steel can be used on magnesium. A weld made with and without the helium shield is shown in Fig. 1.

Weldable Alloys

Dowmetal "J" alloy is the accepted standard, all-purpose magnesium alloy for Heliarc welding. Dowmetal "M" alloy is restricted in its use due to lower strength and poorer Heliarc welding properties.

Other magnesium alloys that are normally rolled, such as FS, can be readily arc welded over a wide range of currents, speeds and filler rods. Weldability is chiefly determined by the zinc content of the alloy. Higher zinc alloys tend to be hot short, and care must be taken to prevent incipient fusion and cracking. When making single pass welds, "M" alloy, because of its narrow melting range and higher melting point, is more critical as to current and travel rate than alloys containing aluminum and zinc and also requires a slightly higher current to weld the same thickness.

Cast metal such as Dowmetal H or C is more difficult to weld than the rolled alloys due to larger grain size, porosity in the metal and the large globules of compound between the grains. Best results are obtained when single-pass stringer beads are used to complete the weld in one pass.

Automatic Equipment

The application of automatic Heliarc equipment has shown great promise and is well adapted to production where long welds and high welding speeds are required. Smooth, uni-

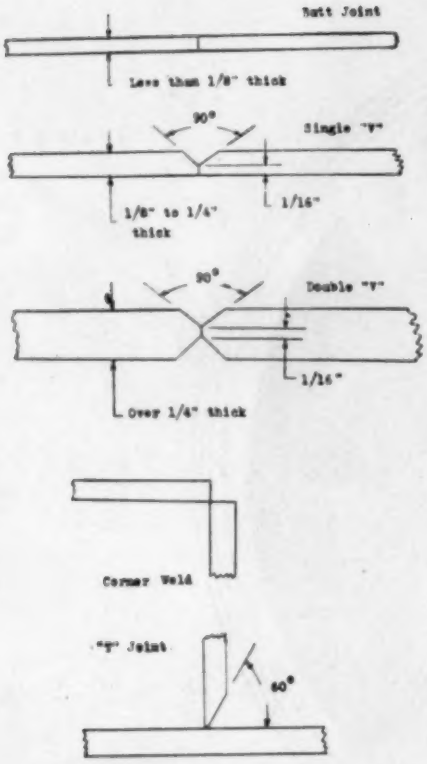

Fig. 2—Methods of preparing sheets and plates for magnesium arc welds.

form welds with high physical properties are obtainable with automatic equipment.

Welding Machines

A standard d-c arc welding generator equipped with variable control is satisfactory for arc welding magnesium. To weld lighter gauges of magnesium, small welders of 150 amp capacity are used. Heavier gauge materials require machines of higher capacity.

Magnesium is always welded with reverse polarity; *i. e.*, with the electrode positive and the work negative. Straight polarity results in an unstable arc and excessive spatter. Recommended current settings, electrode and filler rod diameters, helium flows and pressures for various sheet and plate thicknesses are given in Table I.

Gas Quantity and Control

A tank of helium containing 220 cu ft will supply gas for approximately 15 to 20 hours of continuous welding with a medium size torch. A standard hydrogen or oxygen gauge with a low-pressure regulator calibrated in ounces may be used to control the helium pressure, but a more satisfactory method of regulating the helium is by means of a standard oxygen therapy regulator. These regulators measure the flow of oxygen in liters per minute, from which the helium rate in cu ft per minute may be computed by dividing the reading by 10.

Table I. Selection and Regulation of Heliarc Equipment

Thickness, In.	Current Amp	Filler Rod Diameter	Helium Flow Cu Ft/Min	Helium Pressure Oz/Sq in.	Tungsten Diameter
.030	20	1/16	.3	6	3/32
.040	30	1/16	.3	6	3/32
.050	35	3/32	.3	6	1/8
.060	45	3/32	.3	6	1/8
.070	55	1/8	.3	6	3/16
.080	60	1/8	.3	6	3/16
.090	65	1/8	.3	6	3/16
.100	70	1/8	.3	6	3/16
.125	75	1/8	.3	6	3/16
.150	80	5/32	.3	6	3/16
.200	90	5/32	.5	12	1/4
.250	100	5/32	.5	12	1/4
.500	115	5/32	.5	12	1/4
1.000	130	5/32	.5	12	1/4

Pure Helium Important

Helium is available in standard tanks containing 220 cu ft of gas under a pressure of 2,000 psi. Gas of high purity should be used to produce a satisfactory weld. Helium as purchased from the U. S. Government, however, is generally of sufficient purity to cause no difficulty in welding. Water vapor in helium decomposes in the arc and yields hydrogen and oxygen. Both of these have had bad effects. Hydrogen is very readily absorbed by the molten metal and produces bad porosity. Oxygen reacts to form magnesium oxide, resulting in poor fusion and inclusions. The presence of nitrogen is also to be avoided as it reduces the welding speed considerably.

When the helium tank pressure drops below 50 psi, the remaining gas may occasionally contain water in ex-

Table II. Recommended Stress-Relieving Treatments

Dow Metal Alloy	Temperature °F±10F	Time at Temperature
FS-1a	500	15 Min
FS-1h	265	1 Hr
Ma	500	15 Min
Mh	400	1 Hr
J-1a	500	15 Min
J-1h	400	1 Hr

Table III. Mechanical Properties

Dow Metal Alloy	Form	Ultimate Strength, Psi		Average Joint Efficiency %	H.T. After Welding
		Parent Metal	Welded Joint		
Ma	Sheet	33,000	20,000	60	None
Mh	Sheet	37,000	22,000	60	"
FS-1a	Sheet	37,000	32,000	86	"
FS-1h	Sheet	43,000	33,000	77	"
J-1a	Sheet	42,000	41,000	98	"
J-1h	Sheet	45,000	42,000	93	"
FS-1	Extrusion	40,000	34,000	85	"
J-1	Extrusion	45,000	37,000	82	"
O-1	Extrusion	49,000	35,000	71	"
H	Casting	29,000	26,000	89	As Cast
		40,000	32,000	80	H. T.
		40,000	34,000	85	H. T. A.
C	Casting	24,000	24,000	100	As Cast
		40,000	32,000	80	H. T.
		40,000	34,000	85	H. T. A.

Table IV. Fatigue Strengths

Alloy	Thickness	Type Test	Fatigue Strength Psi — 100,000,000 Vibrations	
			Original Bars	Welded Bars
J	.064	Krause	13,000	12,000
J	.156	Krause	12,000	11,000
C	.500	R. R. Moore	9,000	11,500
C	.500	R. R. Moore	10,000	12,500
C	.500	R. R. Moore	10,000	13,500

Table V. **Strengths of Joints in Lb per Inch of Seam**

Thickness	Butt Welds	Single Lap Weld	Double Lap Weld	Edge Weld	Tee Welds
.063	2,700	900	2,200	400	1,500
.093	3,800	1,200	3,000	750	1,800
.125	5,300	1,500	3,800	1,100	2,200
.187	8,000	2,000	5,200	1,600	3,000
.250	10,500	2,700	7,000	2,300	3,500

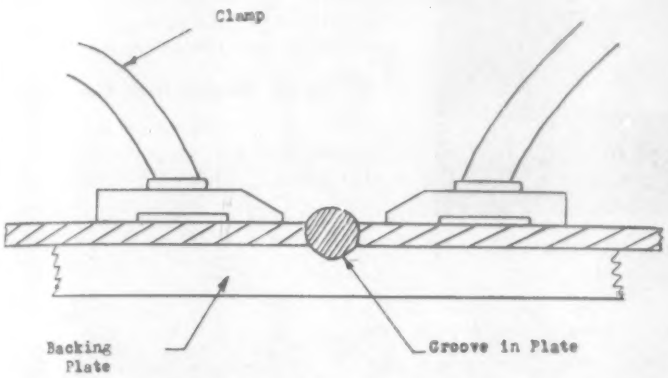

Fig. 3—Use of backing plate and groove prevents excessive "drop-through."

Fig. 4—Electrically pre-heated jig to weld scoop ailerons. A magnesium backing plate is used.

cessive amounts. It is generally good procedure to either pass this helium through a drying agent such as magnesium perchlorate or else discontinue the use of the tank.

Welding difficulties are likely to be caused by helium impurities in excess of the following amounts:

Carbon Dioxide	0.2%
Nitrogen	1.6%
Water	0.029%
Hydrogen	0.2%
Hydrocarbons	Nil

The conventional weldor's helmet with door lens should be available to every operator. A No. 10 shade lens is used by most operators; however, it should be kept in mind that the shade is dependent upon the individual operator and the type of work to be welded.

Preweld Cleaning

The first and most important operation in preparation for Heliarc welding of magnesium alloys is to clean thoroughly all paint, coatings, oxides, grease or any other foreign matter from the surfaces to be welded. Weld porosity can generally be traced back to improper or insufficient surface cleaning. A solvent such as carbon tetrachloride should be used for the removal of oil and grease from magnesium alloys. To clean oxides and light chemical treatments, a hand or rotary brush with wire of 0.003-0.006 in. is recommended, but steel wool, filing or grinding may be used to advantage. Always remove the sheared edges of the sheets by one of the above methods if welding is to be done in that area as the metal is sometimes fractured by the shearing operation. The oil from the shear also leaves a film along the edges of the sheet, which should be removed as mentioned above.

Welding rod coated with magnesium oxide should be cleaned with steel wool before welding to insure a sound weld. An area of approximately one inch along the seam to be welded should also be cleaned as the chemical finish may give off fumes when heated and introduce porosity and inclusions into the weld.

Operating Instructions

The arc is struck by a light brushing action of the tungsten electrode on the magnesium surface and quickly drawn back to the desired arc length. The filler rod is fed into the pool in much the same manner as in oxy-acetylene and carbon-arc welding. The helium cup should be held as closely as possible to the work in order to concentrate the flow of gas around the tungsten electrode to protect the molten weld metal.

The electrode should be held close to the surface to maintain a short arc. A long arc will allow oxides to form, and these may exist as inclusions in the weld. For best results, it is recommended that the entire weld be made with as few stops as possible. When stops are necessary, the weld should be wire brushed before the operator continues. In multiple passes on heavy sections, each succeeding weld bead should be brushed. Upon completion of a weld bead, the helium flow should be continued for a short interval in order to prevent oxidation of the tungsten electrode.

In general, the filler rod should have the same analysis as the material to be welded; however, the use of Dowmetal J-1 has been found to have advantages because of its increased strength. This rod will also minimize cracking, particularly when Dowmetal FS-1 is welded.

Joint Preparation

On material of 0.125 in. or less, the sheets are usually butted together square. Good fit-up is very important, especially with light gauge material, to prevent excessive distortion. Butt joints in material ranging from 0.125 to 0.25 in. should be beveled to a 90 deg included angle. The vee should not extend completely through the material, but a root face of about $\frac{1}{16}$ in. should remain. Butt joints in plates $\frac{1}{4}$ in. and over should be given a double vee. Fig 2 illustrates preparation for butt joints and also for corner and T welds.

If the free drop-down method is used, it is important to have a good fit-up. This method does not require any backing plate as the metal is allowed to drop through to the under-

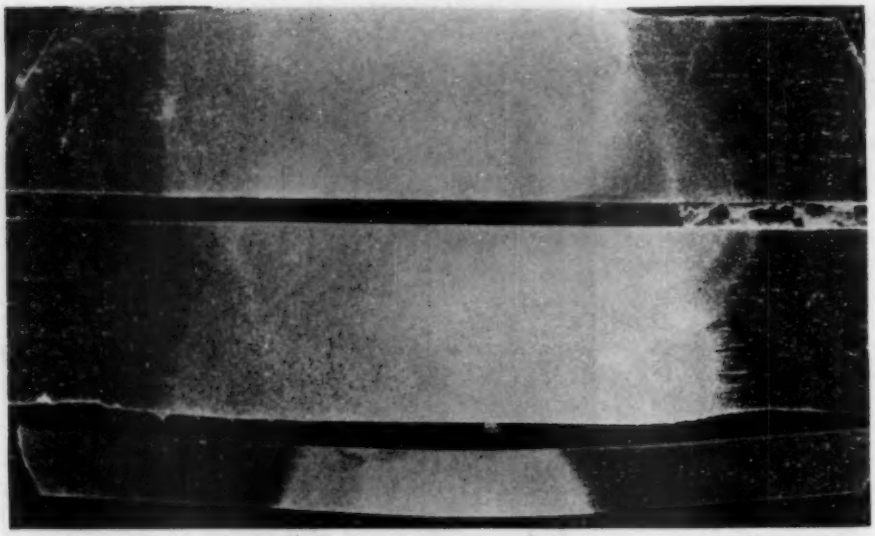

Fig. 5—Macrographs of weld cross-sections. Top: single-pass weld in 0.180 in. sheet; center: double-pass weld in 0.180 in. sheet; bottom: single-pass weld in 0.060 in. sheet.

side, and 100% penetration is obtained in a manner similar to the gas welding of aluminum.

It is sometimes necessary and advantageous to use a backing plate as shown in Fig 3. The backing plate should have a small groove directly under the seam. The dimensions of the groove will allow the weld metal to cast a smooth bead on the underside of the weld. The dimensions vary with sheet thickness, ranging from $\frac{1}{16}$ in. depth and $\frac{3}{16}$ in. width for 0.064 in. sheet thickness to $\frac{1}{8}$ in. depth and $\frac{1}{4}$ in. for 0.125 in. sheet thickness. The chief advantages of the backing groove are to prevent excessive metal drop-down and to help hold the material in line. It also may be used after welding for straightening and stress relieving.

Preventing Distortion

The use of jigs reduces warpage. The jig should hold the parts in alignment with as little restraint as possible and should also allow for expansion and contraction. In addition, it must allow access to seams or joints by the welding operator. If warpage does occur, the parts may be heated to the recommended temperature for stress relief and then pressed or hammered lightly into shape with a leather or wooden mallet. A welded assembly that has warped in the jig may be straightened by reclamping the parts and heating the assembly in a furnace to stress-relief temperature.

Steel and copper backing have both been used on butt joints, but recent experiments indicate magnesium backing to have some advantages for thin material. Magnesium jigs reduce warpage and locked-up stresses, as the jig is heated and cooled at substantially the same rates as the weld. Close tolerances may be held by furnace heating and straightening the parts while they are still in the jig.

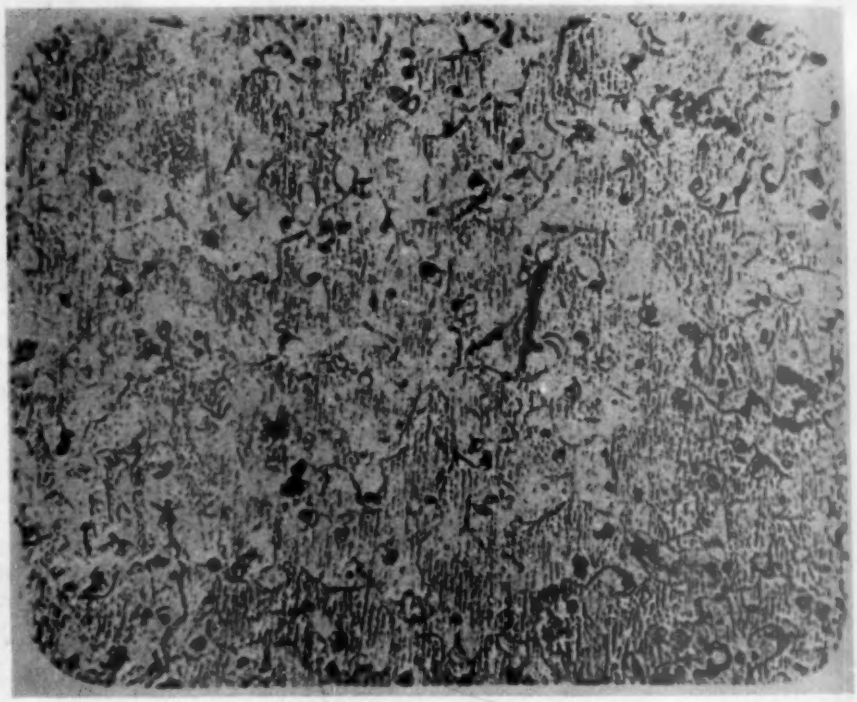

Fig. 6—Average structure of weld metal in an arc weld in Dowmetal J-1 sheet. Magnification 500X.

Preheating and Stress Relieving

Preheating reduces warpage and residual stresses in the welds. Cracking is also reduced by preheating the plate to 200—400 F. Fig 4 is an electrically preheated jig to weld scoop ailerons. Note the magnesium backing. Preheating increases welding speed and permits the use of lower welding current.

The preheat permits a lower cooling rate, which allows the weld to solidify and the weld zone to return to a temperature where it has greater tensile strength before it is subjected to the entire cooling stress.

Magnesium arc welding leaves residual stresses of 1,000 to 15,000 psi in and adjacent to the weld in a longitudinal direction. The residual stresses which are set up after welding should be relieved by heat treatment. If practicable, the entire jig is placed in a furnace and heated at the temperatures given in Table II. After heat treatment, the parts are cooled in still air, preferably in the jig.

Welding Magnesium Castings

It has been proved by application that the Heliarc process is the best method for welding magnesium-alloy castings. Castings must be given the same cleaning process recommended for all magnesium alloys. The filler rod should be of the same composition as the material to be welded.

Cracks to be welded should be ground or chipped to at least a 90 deg included angle. Holes should be countersunk to give complete access to the bottom of the hole.

Preheating is not required for small, minor defects. For complicated repairs, however, the entire casting must be preheated to 500—600 F for small castings and to 700 F for larger castings. Welding should be carried out in one continuous operation in order to prevent heating and cooling stresses. The weld reinforcement should remain wherever possible.

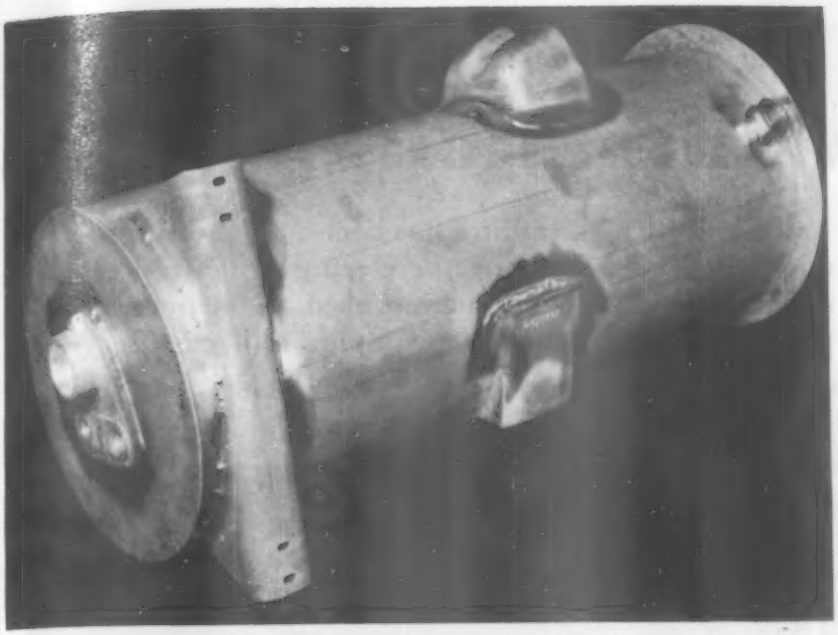

Fig. 7—Tank assembly for hydraulic reservoir. The parts were formed from magnesium alloys and welded by the Heliarc process.

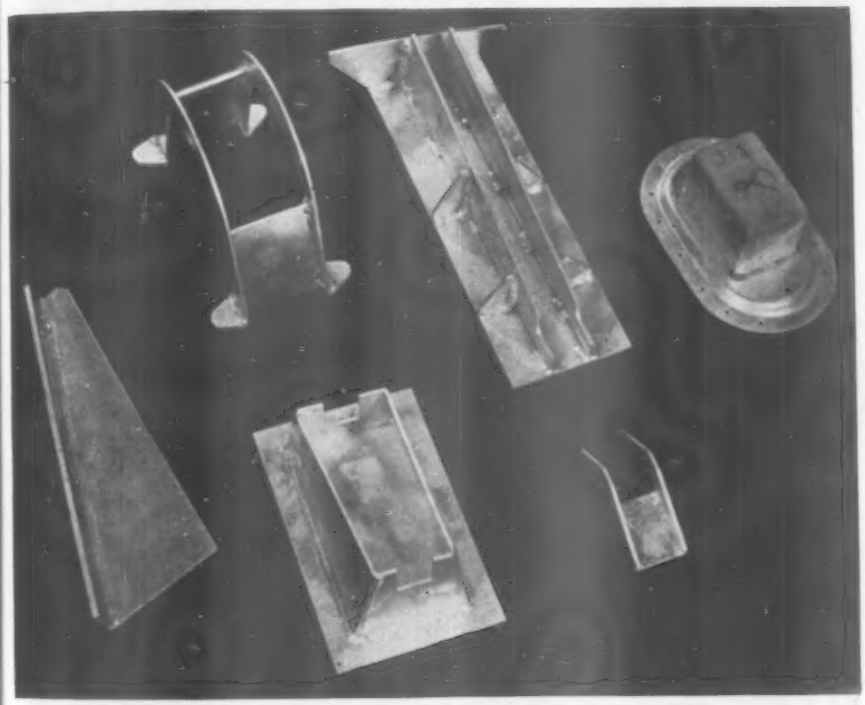

Fig. 8—Arc-welded magnesium production specimens.

If the casting has been solution heat-treated, a re-heat-treat will be necessary to restore it to its original condition. However, in some cases the as-welded condition meets stress requirements and may be used.

Weld Finishing

Because no flux is used with Heliarc welding, magnesium cleaning after welding is a simple operation. The welds are merely wire brushed with a brush similar to that previously mentioned. The parts may then be given the usual chemical treatment prior to painting. If grinding or filing is required to remove excess bead, it should be done before the final chemical treatment.

Strengths of Heliarc-welded joints in various materials are given in Tables III, IV and V.

Inspection Methods

As in other methods of welding, it is always necessary to maintain a careful inspection of welds. For Specification Tests and Aircraft Welding Operator's Certification, reference is made to AN-T-38a and NAVAER-PW-11. Heliarc welds should be checked for undercutting, cracks, porosity, overlapping, craters and inclusions. Most concerns have a set procedure for testing welds and materials that may be modified to serve for testing welds in magnesium alloys.

Most fusion welding testing on fabricated parts is non-destructive, the methods including visual inspection, radiography and the fluorescent oil penetrant. However, there are some tests requiring specimens for macrostructure (Fig. 5) and microstructure (Fig. 6) examination.

As examples of the kinds of assemblies being produced by Heliarc welding, the reader is asked to examine the pictures of the welded tank assembly (Fig. 7) and production specimens (Fig. 8).

Fire Hazards and Precautions

There is no danger of burning or combustion if magnesium alloys are welded by the Heliarc process and the proper technique is employed. In order to burn magnesium, it is necessary to have a source of heat and oxygen. The latter, however, is excluded from the weld pool during welding, as otherwise it would be impossible to make a sound, strong joint. In gas welding, the flux melts and forms a continuous liquid film over the molten pool that prevents oxidation. In Heliarc welding, the oxygen is excluded from the molten pool by a blanket of either helium or argon, both of which are inert gases (chemically inactive). While a source of heat is present during welding, the complete exclusion of oxygen definitely precludes the possibility of burning.

It sometimes becomes necessary to grind or otherwise remove weld beads or excessive penetration. The resulting small magnesium particles are highly combustible and should be carefully exhausted into a container of water.

References

W. S. Loose and A. R. Orban, "Arc Welding of Magnesium Alloys," THE WELDING ENGINEER, December, 1942, and January, 1943.

Thomas E. Piper, "Heliarc Welding," THE WELDING ENGINEER, September, 1942.

Welding Exposition in Print

To fill a need created by the probable postponement of the annual meeting of The American Welding Society and The National Metal Show, usually held in October, The October Issue of THE WELDING ENGINEER will feature the first WELDING EXPOSITION—IN PRINT. This is one issue you will want to read from cover to cover.

Radium Examination of Welds

Radiography with radium has become a thoroughly tested and approved method of uncovering defective welds. This article tells how it is being used in structural welds, pressure vessels, machinery welds and casting repairs.

By **JOSEPH S. HARRIS**

Technician, Canadian Radium & Uranium Corp.

THE extensive use of radiographic examinations as required by various codes, specifications and contracts attests to the value of this method as an inspection tool. The ability to detect flaws within the body of the material without destructive sectioning of the casting or weldment has resulted in improving the quality and production rate of many war and civilian products without any uneconomical increase in costs.

General Considerations

Obviously, the successful application of any inspection method depends on the validity, reproducibility and uniformity of interpretation of the results obtained. In radium radiography, the validity of the results has been proved many times over by the sectioning of experimental or non-salvagable materials. These sectionings (as well as repair operations) have definitely revealed the defects disclosed by the gammagraph—a radiograph made by using gamma rays emanating from radium.

The reproducibility of the gamma-ray inspection method has been adequately demonstrated and is based on the high degree of standardization developed. The radium itself, sealed in a silver cylinder and encased in an aluminum or steel container (appropriately known as a radium pill), is calibrated for radiation intensity by the Bureau of Standards. This intensity may be assumed to be constant within measurable limits for a great many years to come, in view of the fact that existent radium will lose only half of its intensity in about 1,690 years.

Determining Exposure Time

Radium radiography techniques are well standardized; in many instances only one method, which would be selected independently by various radiographers, can be applied for optimum results. Exposure times are based on the density and thickness of the material being examined, the film-to-radium distance and the size of the

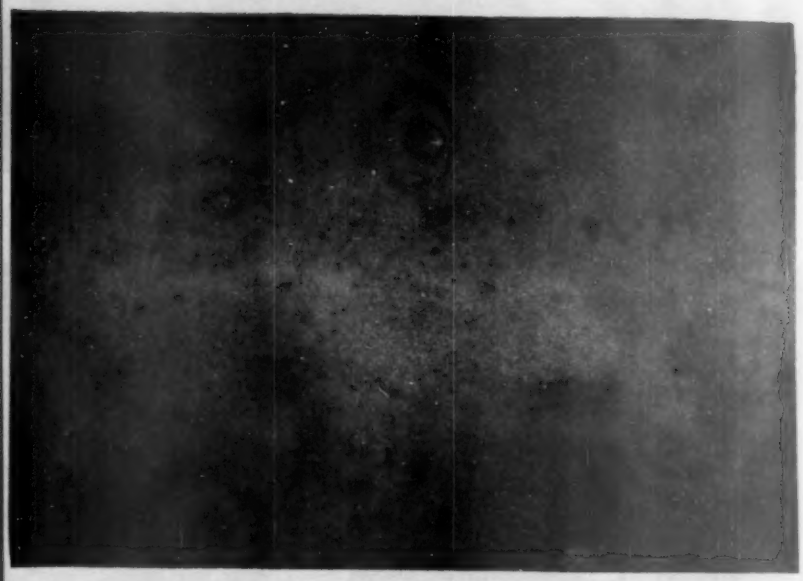

Fig. 2—Excessive porosity in weld metal as revealed by gamma-ray radiography.

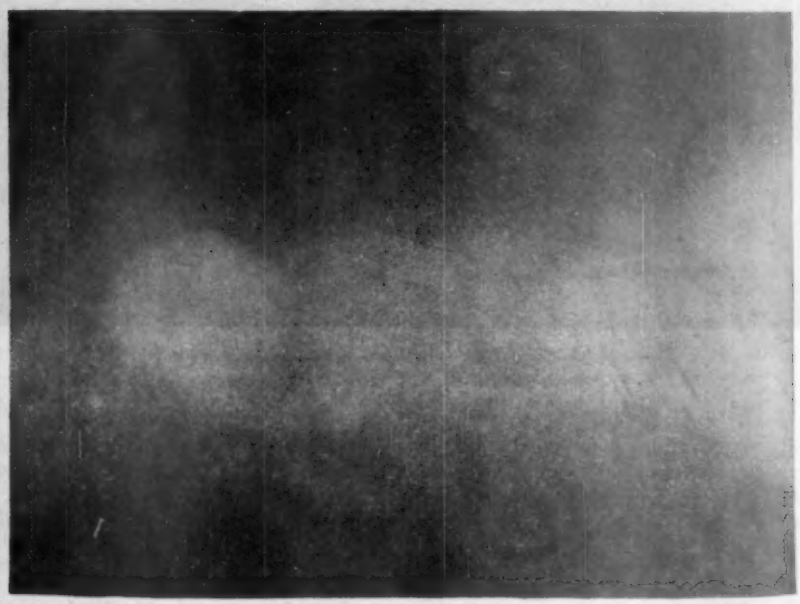

Fig. 3—Unsatisfactory welded joint showing lack of fusion.

Fig. 1—Radium radiographic slide rule.

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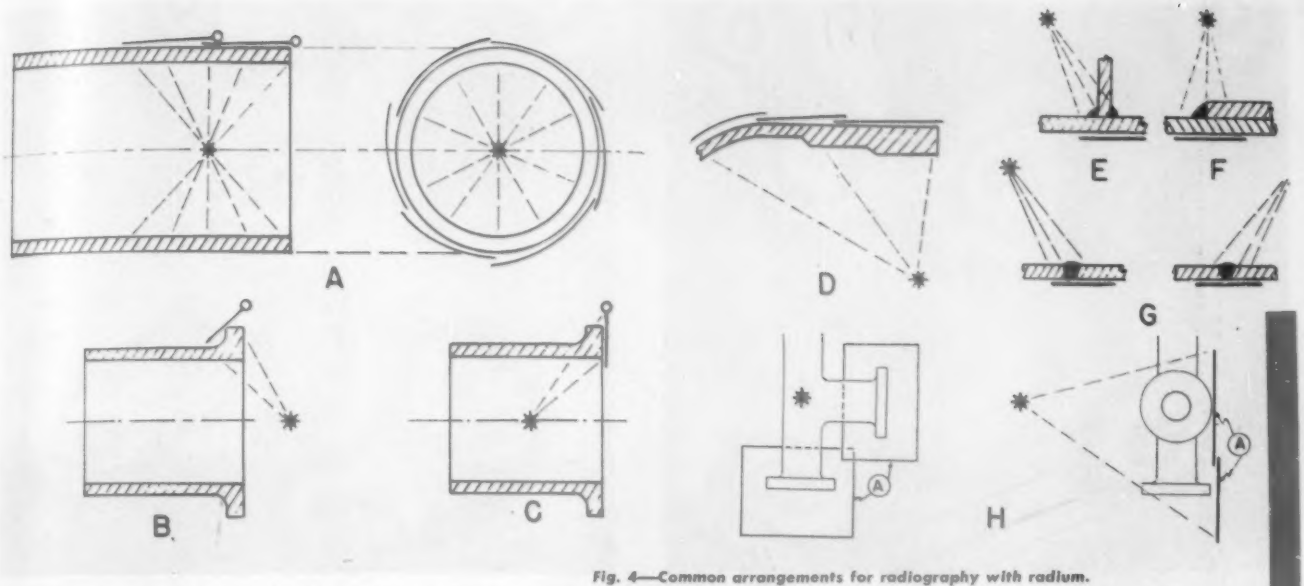
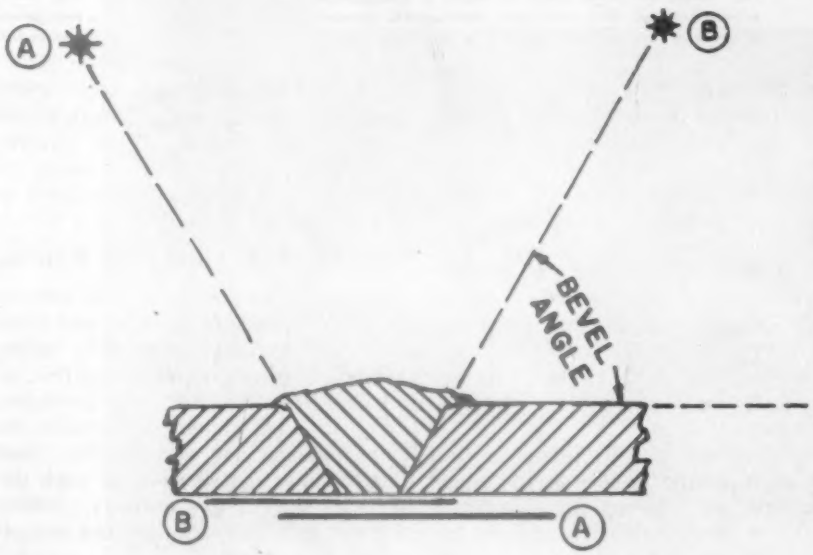


Fig. 4—Common arrangements for radiography with radium.

radiation source (expressed in milligrams of radium). These various factors are either known in advance or are measured for the particular application, and the exposure is then determined from standard exposure slide rules, generally obtained with the purchase or rental of the radium.

Fig. 1, taken from Canadian Radium & Uranium Corporation's "Manual on Industrial Radiography," as are all the illustrations accompanying this article, shows a straight-type slide rule that materially facilitates exposure-time calculations.

As with any inspection method, the interpretation of the results will depend to a large extent on the experience and background of the radiographer or inspector. However, there are available standards for comparison, and these are generally well enough defined to assure similar ratings by various interpreters.



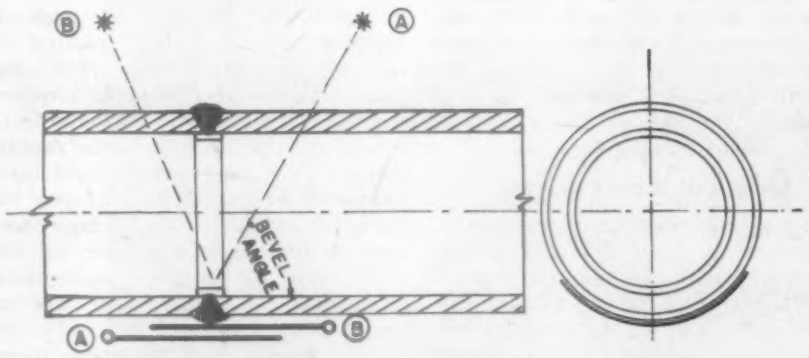


Fig. 5—Radiographic set-ups for examining welds in piping. The lower set-up must be used if the pipe is too small to permit the films to be located inside it.

Structural Welding Advantages

The primary advantage in the application of radium radiography to structural welding, including ship hulls, is the portability of the equipment. All that is necessary for radiographic examination is the radium (generally carried in a lead safe for safety purposes), the film and a holder for positioning the radium pill. The entire equipment can be carried by one man, to any location accessible to him.

A second, and equally important, advantage of radium radiography is the inherent characteristic of the method to penetrate varying section thicknesses. Even materials of different densities can be handled at one exposure, with satisfactory densities and sensitivities over all portions of the gammagraph. This characteristic allows a one-exposure examination to be made of fillet welds, corner welds, welds against backing strips, bronze welds on cast iron and numerous other combinations of thickness or materials without the necessity of radiographic shielding of the thin sections or lighter metals.

Welding Defects

Structural welding generally is held to less rigid requirements than those stipulated for the welding of pressure vessels. The chief defects to be looked for are: lack of fusion or penetration, either at the root of the weld or at the center of a double-vee joint; excessive porosity; slag inclusions; cracks. All of these defects are read-

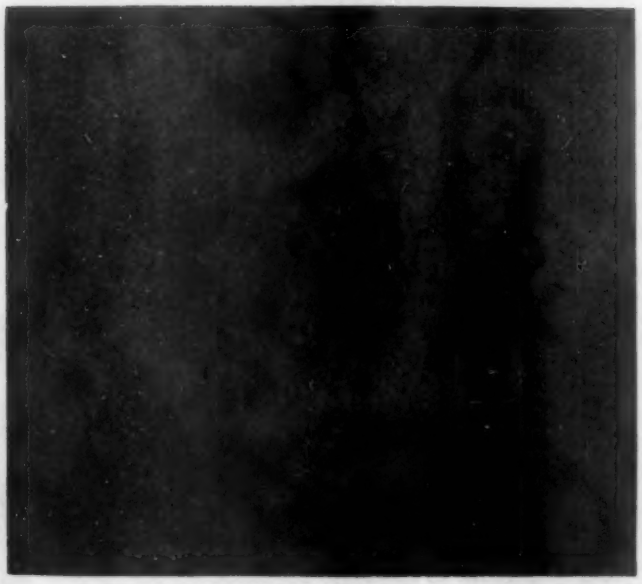


Fig. 6—An arc weld made to repair a manganese-bronze casting. This weld was unacceptable because of lack of fusion and cracking of the base metal.

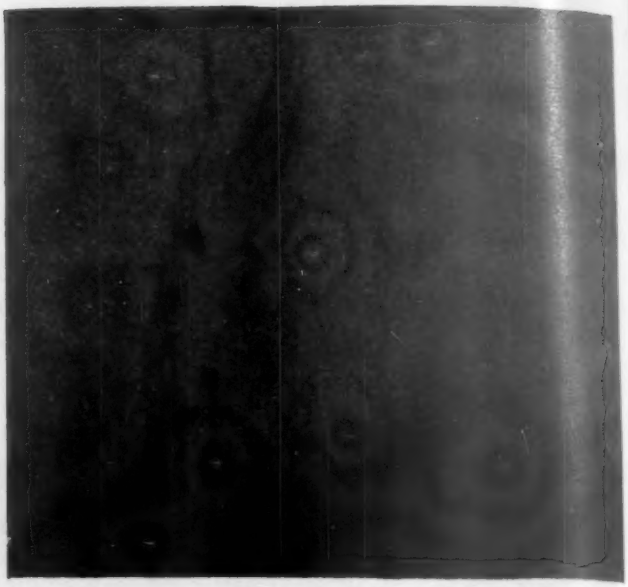


Fig. 7—A gas welded repair in 2 in. thickness of a manganese-bronze casting. This weld was also unacceptable because of incomplete fusion and cracks.

ily recorded on the gammagraph, and the sensitivity of the method is adequate for even thin sections.

Fig. 2 shows excessive porosity in a weld. Such gross porosity would be considered grounds for rejection, especially in an assembly subjected to high stresses. Note that the surface irregularities of the weld also shown in the gammagraph do not obliterate the defects. The surface irregularities, in fact, are highly useful in fixing the exact locations of the defects for repair.

Fig. 3 shows lack of fusion at the sides of a double U-type weld. Slag inclusions are shown as elongated streaks of varying density, and cracks are readily observed as fairly sharp, dense lines. The experience of the radiographer as well as his familiarity with the design of the welded joint will determine his ability to differentiate between the various types of defects, some of which such as slag inclusions and lack of fusion appear similar to an inexperienced eye.

Length of Weld Covered

Fig. 4 shows diagrammatically various arrangements of films and radium frequently used in radium radiography. Set-ups E, F and G are typical of those used in the examination of structural welding. The length of weld examined in one exposure will vary with the film-to-radium distance selected; for the majority of exposures the latter will be 12 to 18 in., which distance will correspond approximately to the length of weld covered. In some instances, as when radiographing welds under an inch in thickness, the length of weld examined may be up to twice the film-to-radium distance with satisfactory densities over the entire length of the weld. Girth welds can be covered completely in one exposure, using the radium at the center as shown in A of Fig. 4.

Pressure Vessel and Pipe Welding

Code requirements for the radiography of pressure vessels and pressure piping are constantly being amended as necessitated by the increased temperatures and pressures being applied in use. Generally, the requirements for acceptability limit the size and distribution of such defects as slag or gas porosity. Other defects such as cracks are not acceptable in any length.

Radium radiography has been extensively applied in this field. The availability of the new fine-grained, high-contrast films has resulted in increased sensitivity, thus producing gammagraphs of acceptable requirements for detection of the finer defects considered in pressure-vessel applications. The parts which have been examined by radium radiography include valves and fittings for high pressure or temperature service, oil refinery towers, penstock piping and miscellaneous castings for special pressure applications.

The set-ups used are those mentioned for structural welding, including Fig. 4-A, and also that shown in Fig. 5. The set-up of Fig. 4-A would be employed for the examination of a girth weld and would allow the entire weld to be examined in the one exposure; the radium in this instance is at the center of the structure and therefore equidistant from the weld at each position around the pipe circumference.

Fig. 5 represents single-wall and double-wall arrangements for the examination of pipe welds; the selection of which set-up depends on the accessibility of the inside of the weld for the placement of the film. The upper diagram shows the set-up used when the pipe diameter is sufficiently large to permit the films to be placed inside the pipe. When the pipe is too small for this procedure, the lower set-up must be employed.

The advantages already noted of extreme portability and the ability to record defects simultaneously in adjacent sections of varying thicknesses apply equally well to pressure welds. Radium radiography will reveal detail in all sections of fillet welds such as would be used at manhole connections, pads, reinforcing collars and other inlet and outlet connections. These welds are as important to the soundness of the completed assembly as are longitudinal and girth welds. The ability of the radium gamma rays to penetrate heavy sections is a further advantage to be considered, especially in view of the progress towards higher pressure and temperature services which require these increased section thicknesses.

Machinery Welding Applications

This field includes the production of weldments for such purposes as machinery, turbine and reduction gear foundations, fabrication of heavy machinery items such as press frames, gear cases and turbine casings, and the miscellaneous items used in ordnance such as gun mounts, turret tracks and turrets. The weld requirements are less restrictive than for pressure welds

but generally demand sounder deposits than would be acceptable for structural work. Weld defects are the natural starting points for the development of fatigue fractures.

Many of the items noted above are subjected to impact or shock loading, and the presence of such defects as lack of fusion at the root of the weld, excessively long slag inclusions or cracks might result in the premature failure of the unit.

Radium radiographic inspection has been used extensively in this field because of the variable section thicknesses encountered. Many of the welds are fillet or corner welds, and the inspection set-ups generally are similar to those used in the examination of structural welding. The portability and ease of manipulation of the radium capsule make it ideal for the radiographic inspection of the welds in large units.

Repair Welding Applications

Radium radiographic inspection of castings has been and will continue to be relied upon by consumers interested in obtaining sound, pressure-tight castings and by foundrymen interested in producing them. Again, the ability of radium inspection to reveal defects through wide variations of section thickness is ideally suited to this application.

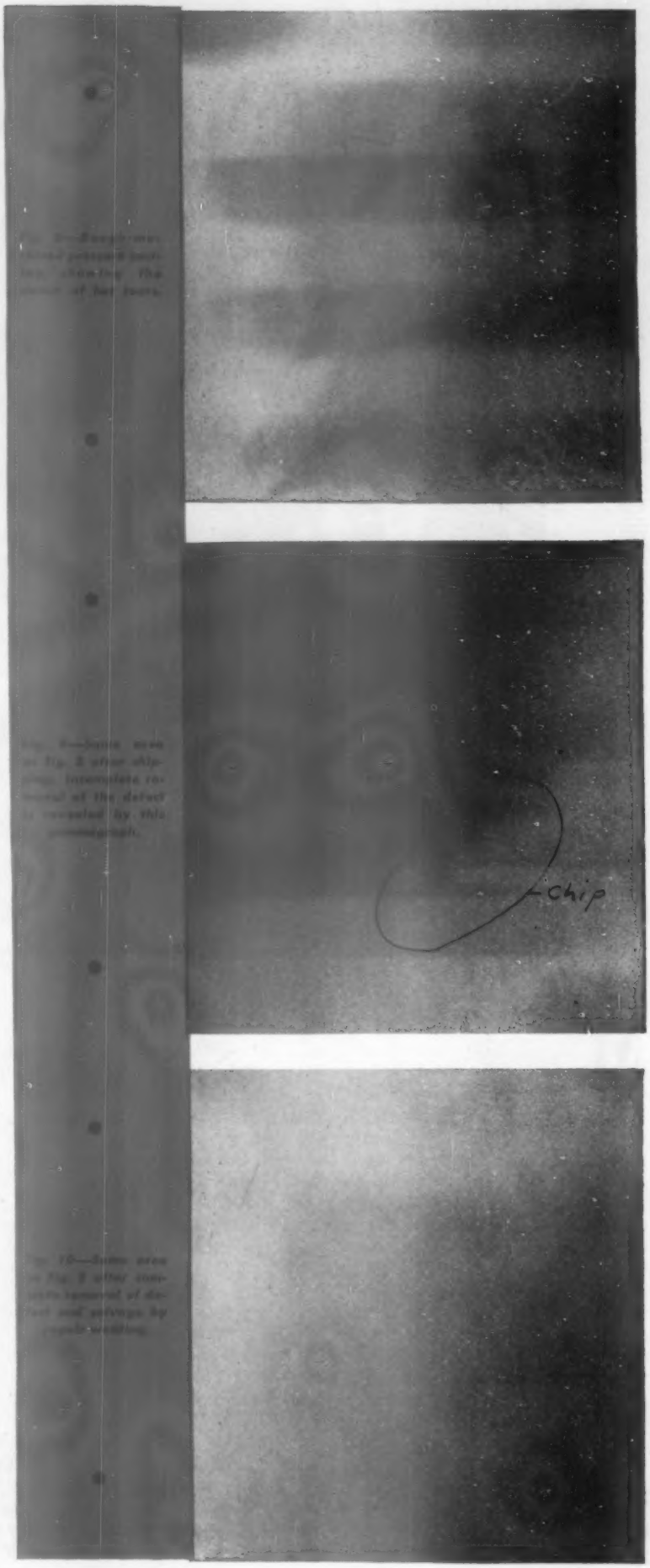
Unfortunately, not every casting made has the soundness and freedom from defects required for acceptance. Most rejected castings, however, may be salvaged by repair welding. Such welding must obviously be held to the same degree of soundness demanded for the casting; in many instances repair welding is considered on the same basis as pressure-vessel welding.

Radium radiography is applicable specifically to repair welding in addition to its use in the detection of the defects requiring the repairs. The defect is first eliminated by chipping or grinding, and the chipping job is then checked by radiographing the suspected area before adding new metal by welding. This not only assures the complete removal of the defect but provides a record of the area for comparison with the results of the radiographic examination of the repair welding. Minor defects showing in both films are known to have existed in the casting and so cannot be the result of poor welding.

The set-ups used for repair-weld inspection are similar to those shown in Fig. 4-A, B, C, D and H. These arrangements are simple but will cover the majority of cases encountered.

Figs. 6 and 7 show defects, generally lack of fusion, in electric and gas welds made on manganese bronze. These radiographs illustrate the applicability of the gamma-ray inspection method to materials other than steel.

Figs. 8, 9 and 10 show the sequence involved in the examination and repair of a casting. The original examination of the casting (Fig. 8) revealed a defect—hot tears. Subsequent examination of the chipped-out area (Fig. 9) still showed part of the original defect, which had to be removed before repair. The examination of the area after the repair welding (Fig. 10) showed complete removal of the defect as well as a thoroughly sound weld deposit.



Welding in a Cement Mill

Welding arcs and sparks are a familiar sight around a cement mill. Long ago the cement mill operator learned of the 100 important uses to which welding may be put.

By **T. B. JEFFERSON**

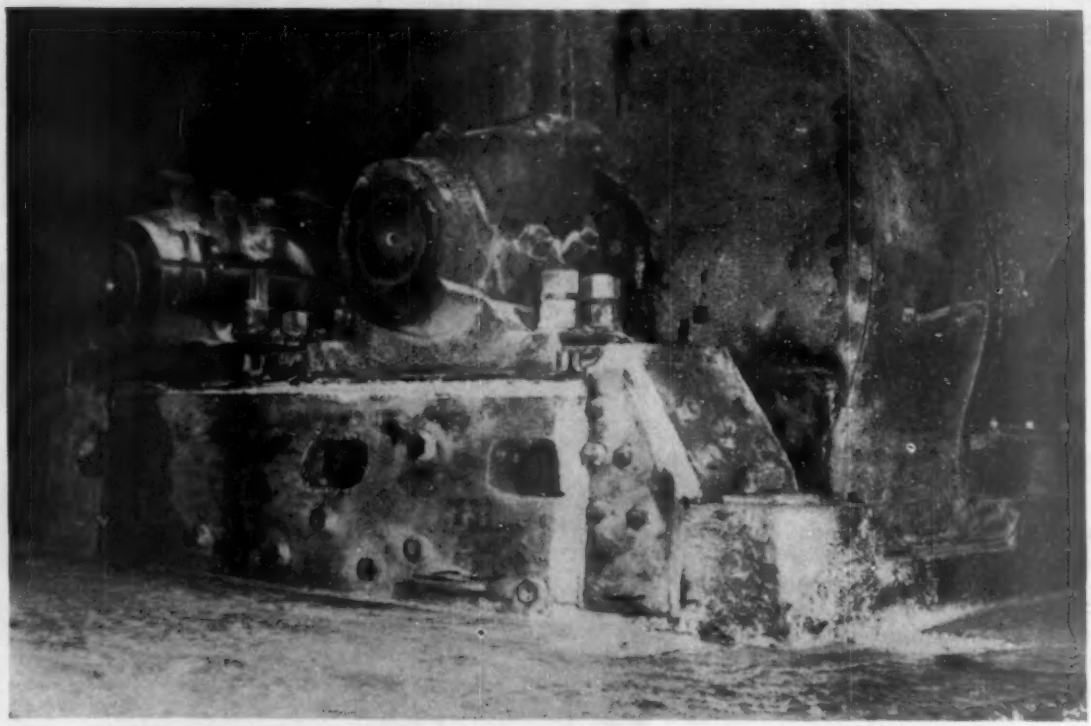


Fig. 1—Repair of this cast-iron main drive base of a rotary kiln was the first big cast-iron welding job to be undertaken. The picture shows the completed repair with a 1 in. steel plate reinforcement welded in place.

MILLIONS of barrels of cement are needed to take care of our war and construction demands. Its manufacture is not easy. Few industries are confronted with the combined problems encountered in the process of converting stone and gypsum into the finely ground powder we call cement. Equipment must be capable of withstanding abrasive and impact wear, high temperature and tremendous loads. In addition, there is the highly abrasive action of the finished product to contend with. It all adds up to many headaches for the mill superintendent, who is responsible for the continuous operation of the mill and its production, and the general mill foreman, who must keep the equipment in operation.

Maintenance in the Quarry

The mill's maintenance problems begin in the stone quarry. Drills, power shovels, trucks, narrow-gauge railroads and hand tools must be kept in working order to produce rock in large quantities. The task simply could not be done without welding, which is vital to the maintenance of all types of quarry equipment.

One of the South's largest cement manufacturers is the Lone Star Cement Corp., Birmingham, Ala. Its quarry equipment includes two 1½ cu yd electric shovels, two 6 in. rock drills, two narrow-gauge electric locomotives, some twenty dump cars and, of course, the usual hand tools. Thanks to welding, most of this equipment has been working for years in the 100 ft excavation behind the Birmingham mill.

Welding has built new shovel booms capable of standing the daily gaff of removing tons of hard, heavy limestone from the blast down 50 ft of quarry face. On numerous occasions welding has been called upon to repair the car body frames, track frames, track pads and rollers as well as many other shovel parts. Judiciously placed hard-facing deposits have aided greatly in lengthening the life of the shovel dipper and the dipper teeth.

Power Shovel Repair

The cutting torch, the welding torch and the electrode were found to be useful tools for the repair of a shovel cab damaged by stone that had traveled too far after blasting. Such damage is so rare as to be considered almost impossible—a fact attested to by the numerous safety awards won by the Birmingham Lone Star plant. Nevertheless, it *has* occurred, and it is comforting to the management to know that such convenient repair tools are available when needed.

Though handy and efficient for emergency repairs of power shovels, welding is even more necessary to the mill in the routine maintenance and

Fig. 2—There were a total of 10 ft 2 in. of crack in the cast-iron diaphragm and eccentric bearing barrel of a 30 in. gyratory crusher. Here the crack has been vee'd out preliminary to welding.

repair of its narrow-gauge dump cars. These cars, which haul rock from the quarry to the crusher, are subjected to continual assault from the huge pieces of stone dropped into them and later dumped into the crusher. Welding keeps them in serviceable condition.

Damage in the Kiln Room

But applications of welding are not confined wholly to the quarry. It was in the kiln room that John O'Callaghan and James Honeycutt, superintendent and general mill foreman, respectively, for Lone Star, learned what welding really could do to restore heavy iron castings.

The broken part was the cast-iron main drive base of a rotary kiln 280 ft long and 10 ft in diameter. The third train shaft broke, allowing the main pinion to drop down. Pressure of the kiln forced the pinion against the end of the base, causing it to break in a number of places. The main drive base is roughly 7 by 12 ft by 1 ft 3 in. high and is grouted into a concrete foundation of about 6 in.

To change this base, it would have been necessary to chip the old frame out of the grouted foundation with paving breakers and then set and regrout the new frame in the foundation again. Furthermore, it would have been necessary to shut down this particular kiln for months while waiting for delivery of a new casting.

Saved by Welding

While Messrs. O'Callaghan and Honeycutt were dolefully surveying this pleasant prospect, John C. Thieme, an Atlanta welding consultant, arrived on the job. He suggested that the 20 or so pieces of the broken casting be reassembled and welded together, using a low-temperature copper-nickel alloy welding electrode. The joining of a score of pieces of cast iron varying from 1 to 2½ in. in thickness scarcely seemed feasible, but the wartime demands for cement made it well worth a try. The magnitude of this particular welding job can be best indicated by the fact that over 100 lb of electrodes were used.

Not wholly trusting this welded repair, the management decided to reinforce that end of the frame in which the major breaks occurred by bolting and welding a 1 in. plate in place. After this operation, the finished job appeared as shown in Fig. 1.

Welding indeed proved its worth in this instance by making it possible to effect repairs and put the kiln back into operation within a week for a cost of approximately $500. A new base and the work that would have been incurred in installing it would probably have cost between $3,000 and $4,000, to say nothing of the delay involved.

Trouble Strikes Again

As the old saying goes, "It never rains but it pours" and that seemed to be the situation at the Birmingham cement plant. Scarcely was the repair finished on the main drive base on the kiln when the 30 in. gyratory crusher developed a crack that made further operation impossible. The crusher barrel of the main frame had been cracked for some time, but it could still be used. Now, however, the crack opened to such an extent as to cause

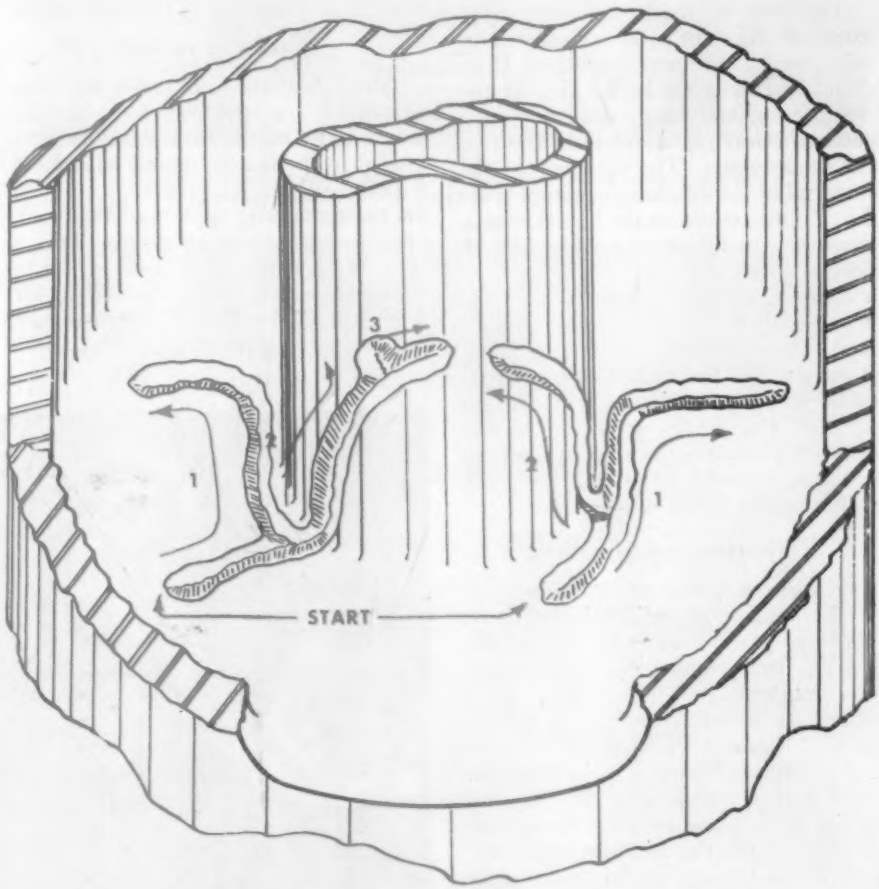


Fig. 3—The welding sequence of the gyratory crusher repair is indicated by the numbers. One groove was completed before another was begun, though the welding was skipped from one side of the barrel to the other. When the deposit became hot to the hand, weld metal was deposited in the opposite groove. No preheat was employed.

the eccentric bearing to lose its lubricating oil. Since it is impossible to operate the crusher without lubricating this bearing, it became obvious that the crusher must either be repaired or a new base or main frame obtained.

Again the material was cast iron. Difficult as cast iron is to weld, it seemed that in this instance welding, if at all possible, would be a wise choice. The base in which the crack occurred weighed 25 tons and was grouted into a foundation approximately 12 ft above the ground. To replace the cracked base would necessitate the lifting of all the parts above it and chipping the base out of the foundation so that it could be lowered to the ground. A further complication was provided by the fact that the crusher house had been built after the crusher had been mounted on its foundation and there was insufficient room to lower the 25 ton base. It could only have been done by tearing out a gunnited concrete wall of the four story building. In addition to all these difficulties, four months would be needed to get the $6,000 base from the manufacturer in Milwaukee.

Ten Feet of Cracks

The job of welding this casting, however, was not to be considered an easy one. There was a total of 10 ft 2 in. of cracks on both sides of the diaphragm, and these ran up on the eccentric bearing barrel until the two ends nearly met. The thickness of the material in the diaphragm varied from 3 to 2¾ in., while on the barrel, it was necessary to fill up a groove 2¾ in. deep.

Despite all this, welding was the only solution so far as the crusher base was concerned. All of the limestone used in the manufacture of cement in this particular mill had to go through the 30 in. crusher. If the crusher were out of operation for four months, it would mean that the plant would have to shut down.

Preparing for Welding

The first step was to locate the ends of the cracks and drill holes through the base material so as to prevent the cracks from continuing as chipping was undertaken. The holes were drilled on both the top and the underside of the diaphragm as well as on the inside and outside of the barrel inasmuch as the cracks did not end in the same place on both inside and outside. After the location holes had been drilled, chipping hammers were employed to vee the base metal from top side nearly through the casting as is shown in Fig. 2.

The welding operation was then undertaken by weldors Earl Dickinson and Claude Fortner, under the supervision of R. H. Hickey, machine shop foreman. Incidentally, it might be mentioned that the Lone Star Cement Corp. has been doing its part towards the rehabilitation of returning war veterans. One of the helpers used on this job had been severely wounded in the South Pacific, and he is working as a helper between trips to the hospital for operations to remove shrapnel.

The welding was continuous and employed 5/32 in. copper-nickel alloy coated electrodes—the same type of electrode used on the main frame repair job. The welding sequence is indicated in Fig. 3. About 10 in. of an electrode was deposited, then the weld deposit was thoroughly peened. The base metal was kept cool by shifting the work from the crack on one side to the crack on the other. The weldors were cautioned never to let the deposits get so warm that they couldn't hold their hands on the deposited weld metal immediately after peening. This simple test eliminated many possibilities of setting up strains due to excessive heating in the base metal.

Working Inside

After all of the weld metal had been deposited on the outside of the diaphragm and the barrel, the weldors moved to the inside, taking with them the chipping guns. First they chipped out the remaining portion of the crack on the inside and then deposited a light bead overhead and peened it to bring the job up to size. The repair was completed after 220 hours of continuous welding, during which 226 lb of the low-temperature coated copper-nickel electrode were deposited. The finished weld on the outside of the barrel and diaphragm is pictured in Fig. 4. The size of the weld involved may be determined from the ruler.

No Preheat Required

A point that should not be overlooked in the repair of this huge casting is the fact that every effort was made to keep the casting cool. Preheating was not employed. If it had been necessary to preheat, the job would have been far more difficult, if not actually impossible, because of the location of the cracks. Since the weldors had to work inside the casting, the application of preheat would have placed them in the intolerable position of working in a location comparable to the inside of a heated oven.

The welding repair costs, including weldors, helpers and materials, were approximately $900, and it is estimated that $600 should be charged to the job of dismantling and reassembling the crusher. The ability to arc weld the crusher in position saved the Lone Star Cement Corp. around $8,500, inasmuch as the installation of a new crusher base would have run approximately $10,000 for labor and materials.

As in so many welding jobs, however, it is impossible to state the full saving made possible through the use of welding inasmuch as there is no way of knowing just how much time and production were actually saved. The crusher was out of operation about three weeks as compared to a possible five months had the welded repair not been successfully completed.

These few examples well illustrate the part that welding is playing in the cement industry in keeping crushers and kilns rolling.

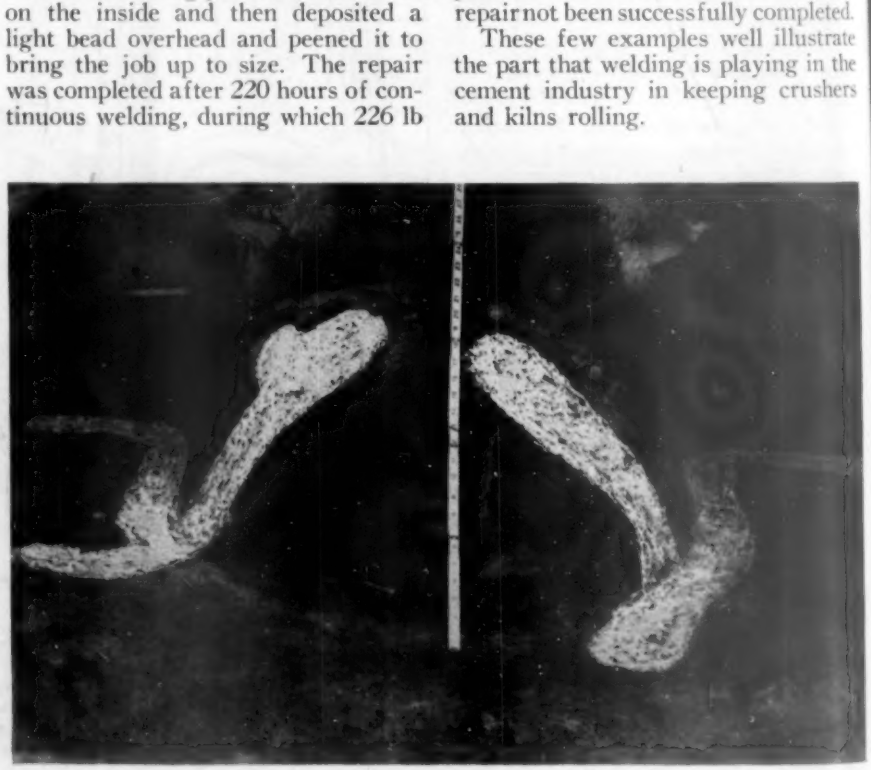


Fig. 4—The weld was peened to bring the deposit flush with the base metal. The rule indicates the sizes of the welds involved.

Semiautomatic Welding

Ingenuity in the design of special handling facilities made it possible to use automatic welding machines on large parts of irregular shapes.

By **JOHN LIPPART**
Steam Div., Westinghouse Electric Corp., South Philadelphia

In developing applications of machine welding, it was necessary for us to design special handling facilities and equipment to support the automatic welding head. As a result, parts of irregular shape which were thought impossible to weld automatically are now being welded by machine.

We now have two welding machines operating on large fabrication, and they save us 32,000 man-hours per year in addition to the conservation of welding rod materials and the manpower required to coat the rods.

The outstanding feature of this equipment is the fact that it can be applied to small quantity production. Furthermore, the welds meet the requirements of high-strength and X-ray inspection. Another advantage is the elimination of the use of costly equipment such as overhead cranes to handle the big weldments.

Fig. 1 shows a bearing housing clamped to the table of a standard welding positioner. The welding head is held in a stationary position, and the work is rotated beneath it. Because of the highly liquid state in which the weld metal is deposited, the electrode is set ahead of the center of rotation to allow time for the metal to freeze before it passes the level position.

Fig. 2 shows two bearing caps clamped to a plate tilted at the proper angle for welding. In this set-up the work remains stationary, while the machine travels on a track on the arm of a specially designed fixture. The arm holding the welding machine is geared to a motor and can be raised or lowered to suit the work.

In using the equipment of Fig. 2, care must be taken to position the work in proper relation to the welding head, or the metal will be deposited off-center and may require considerable chipping. Maintenance of a constant distance between the work and the welding head is not important as the machine is constructed to feed the rod automatically to the proper height.

The speed of travel and the line current are set in accordance with a chart based on equipment manufacturer's recommendations and past experience. The setting varies with both the thickness of the plate and the cross-sectional area of the metal to be deposited.

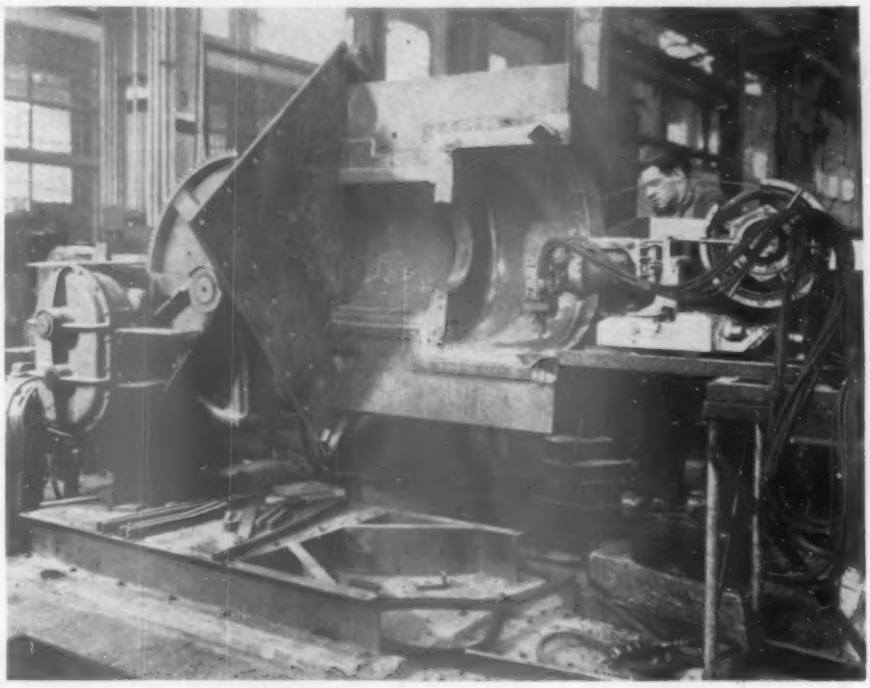


Fig. 1—Semiautomatic machine welding. The welding head is held in stationary position while the work is rotated on a positioner.

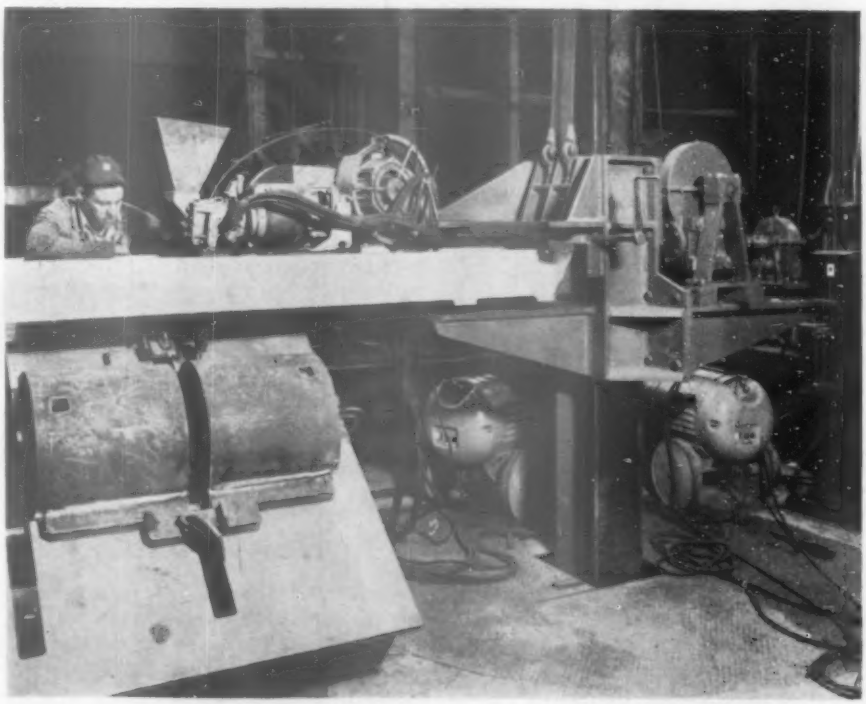


Fig. 2—In this set-up the work remains stationary while the automatic welding machine travels on a track on the arm of a specially designed fixture.

Fabricating Locomotive Parts

Welded locomotives trucks and platforms have proved themselves to be strong without excess weight. They are easily fabricated by cutting and welding readily available rolled steel plates and structural shapes.

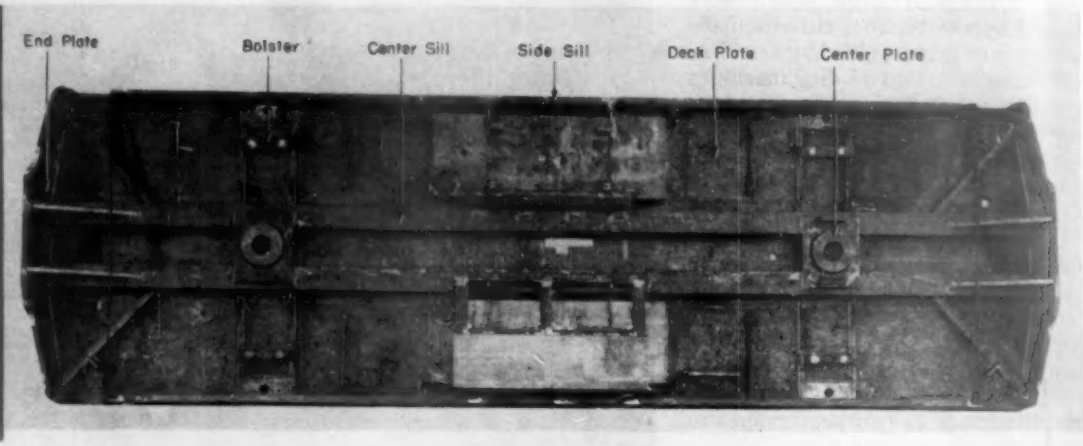


Fig. 1—Underside of platform for 65 ton Diesel-electric locomotive showing the various parts that are described in the text.

By **W. H. COCHRAN**
Erie Works Laboratory, General Electric Co.

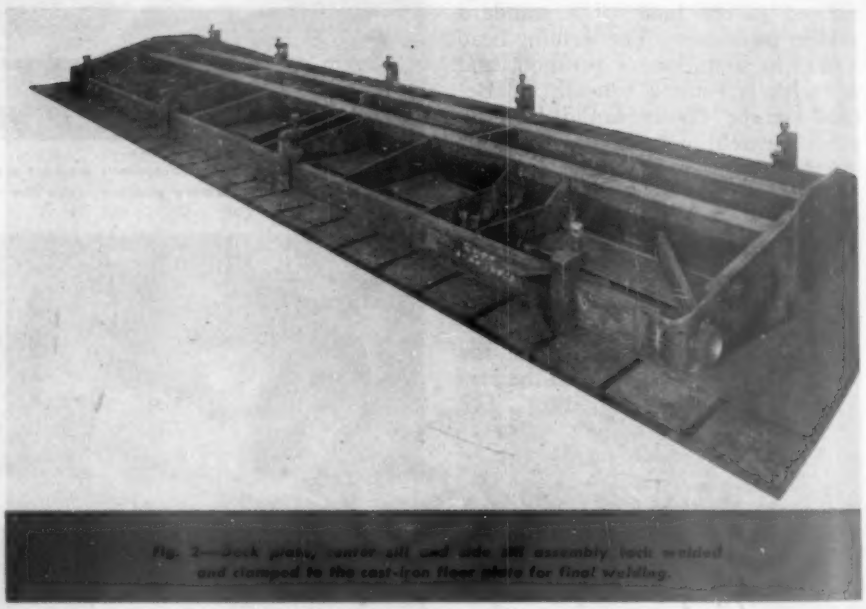


Fig. 2—Deck plate, center sill and side sill assembly tack welded and clamped to the cast-iron floor plate for final welding.

THE use of welding on the locomotive truck and platform (cab underframe) has permitted better designs and has resulted in a product of great strength and durability. Trucks and platforms must be sturdy to withstand the bumps and shocks encountered when switching cars or when running over frogs, switches and rough track. Fabricated by welding plates and structural shapes, these parts can be built into box sections of great stiffness and strength. The use of the minimum of material is another benefit — of particular importance where weight is a limiting factor of design.

Weatherproof Joints

Welding also weatherproofs joints. Locomotives are exposed to all conditions of weather and atmosphere, and riveted or bolted lap joints which cannot be periodically inspected and painted may easily corrode and deteriorate. Lap and T-joints, however, may be easily sealed by continuous welds.

Furthermore, welding is highly advantageous for building the tanks that are mounted under the locomotive. These tanks can be easily fabricated in any size or shape to utilize space that might otherwise be wasted. A properly welded tank remains tight, and the weld will last at least as long as the rest of the material.

Platform Parts

The general construction of a locomotive platform is shown in Fig. 1. The principal parts are the deck plate, center sills, side sills, bolsters, end plates and center plates. The two center sills run the full length of the platform under the deck plate and are the main support for the platform as it rests on the truck. The bolsters are the side cross braces on which the male center plates are attached. The end plates, attached to the sills and deck plate, carry the couplers, push-pole pockets and miscellaneous items.

Locomotive platforms must be straight when loaded. They must be square, and they must have no twist from one end to the other. The method developed for the fabrication

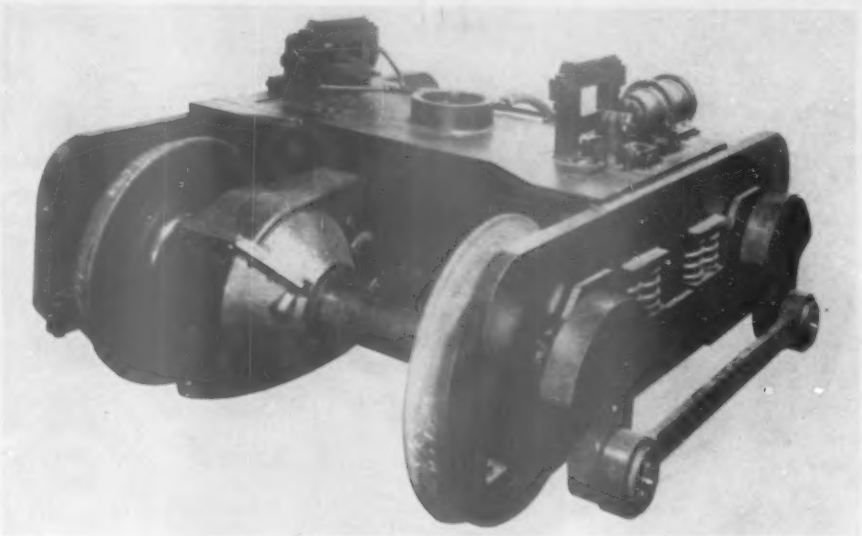


Fig. 3—Truck for Diesel-electric locomotive with motor and brake mechanism assembled.

of platforms by welding is based on years of experience and assures finished products that will meet these requirements.

First Step: Flame-Cutting

The parts are first cut to size with a power shear or with machine flame-cutting equipment from a template or layout. Accuracy in cutting is stressed in order to minimize hand fitting during assembly.

Assembly is begun by laying the deck plate on a large cast-iron floor plate. The latter is set level with the floor and is slotted so that the various parts can be clamped or dogged in position. The two center sills, usually I-beam sections, and the two side sills,

Fig. 4—Truck frame for 100 ton electric locomotive. The small pile of scrap in the foreground is the total amount of scrap remaining after the fabrication of four truck frames.

usually channel sections, are assembled on the top of the deck plate and tack welded in place. The assembly is then clamped along the sides and ends, as shown in Fig. 2, to hold the deck flat across the width during welding. The ends of some assemblies are raised ¼ to ⅜ in. above the floor plate (depending upon the plate thickness and the shape and size of the center sills) to assure the proper camber.

Sills Submerged-Melt Welded

Next the center sills are continuously welded to the deck plate by the submerged-melt process. The equipment consists of an automatic welding head mounted on a portable carriage running on a channel-section track. The track is laid on top of the sills. By using long extension nozzles and a guide wheel, both sides of the center sills can be welded with two set-ups. The welds on thin deck plates are made in one pass, using $\frac{5}{32}$ in. wire with settings of 380 amp, 29 volts, at a speed of 18 in. per minute. A size 20 by 200 granular flux is fed from the hopper. The two 500 amp transformers, a contactor and the welding-head control are mounted in a central location on the floor, and the

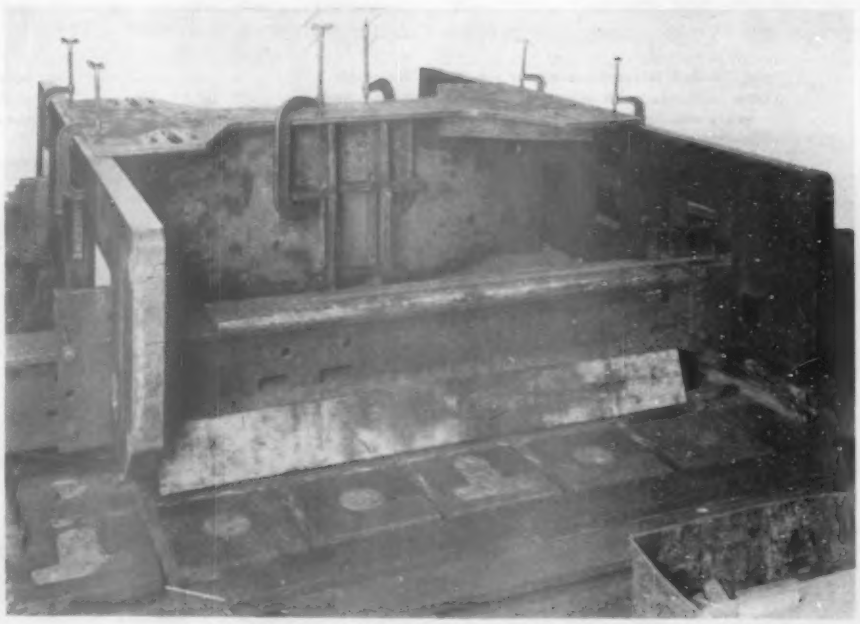


Fig. 5—The truck side plates and center cross member are first assembled in this fixture.

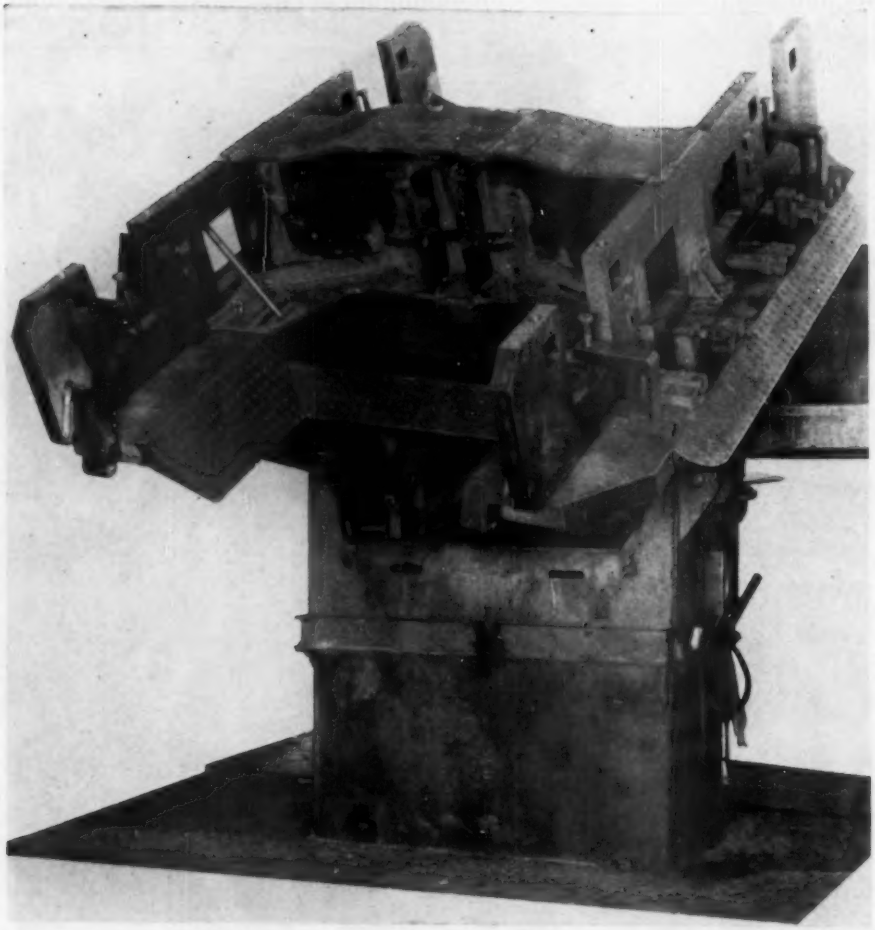


Fig. 6—Positioner for the assembled truck frame. Here final welding is done in the downhand position.

welding current and voltage controls are wired to six sets of receptacles.

One submerged-melt equipment is able to serve an area of approximately 80 by 80 ft. When one platform has been welded, the equipment can be moved to a second platform by simply plugging the power and control leads attached to the carriage into the nearest receptacle.

After the center sills have been welded, the other parts are assembled and tack welded in place. The bolsters, one at each end, are boxlike sections. The top plate of each extends from one side sill to the other and is attached to the center sills at the center-plate location. The bolster side gussets are located between the center sills and side sills. The end plates are usually of heavy steel and are butted tightly against the ends of the center sills. Lighter formed steel sections are butt welded to join the end plates to the side sills.

Vertical and Horizontal Fillets

After all of the above parts have been assembled and tack welded in place, the vertical welds are made—attaching the sills to the end plates, bolster gussets to the sills, braces to the end plates. These welds are made manually, using d-c current with reversed polarity and an AWS E-6010 electrode. Welds up to ⅜ in. fillet size are made in one pass; larger ones must be made in two or more passes. Most fillet welds, however, seldom exceed ½ in.

After all of the vertical welds have been made, the horizontal fillet welds between the deck plate and the assembled parts are made. A-c current and AWS E-6020 electrodes are used for the horizontal fillets.

The d-c welding current is supplied at constant potential by large motor-generator sets. By this arrangement 60-volt d-c welding power lines are available on both sides of the bay. Welding outlets in the form of resistor stations are mounted off the floor, and each station terminates in a plug receptacle in the center of the bay. Thus weldors need only to plug in their electrode leads.

The a-c welding transformers are mounted in enclosures in the center of the bay and are so arranged that a 50 ft lead will serve four cast-iron floor plates. The floor plates are connected to common ground lines (copper bus bars), to which are attached one side of the welding transformers and the negative side of the generators. Extra ground connections are provided for work that is welded off the floor plate. *(Turn to page 77)*

Fig. 7—End frame from an 80 ton Diesel locomotive after collision with a steam locomotive. One end plate was torn out, but none of the welds failed.

Fig. 8—Bolster and center plate after collision with steam locomotive. The impact broke out the bolster plate but did not injure the welds.

Fig. 1 — A welded guide on the end of the bus-bar guard provides a positive means of starting the electrical contacts toward the bus bars.

Welded Safety Guards

To test the electrical connections of bomber turrets, it was necessary to devise a "third-rail" power supply. Welding made possible an ingenious, flexible system.

WELDING has played an important part in the recently completed installation of a collector-type power supply system at the Sinclair Div. of The Glenn L. Martin Co., Baltimore. This type of system is readily applicable to other test and assembly lines where electrical connections are required. The need for such an installation at Martin became apparent when the turret testing lines were extended from 25 to 150 feet.

Long Cables Dangerous

On the short line the necessary connection had been made by plugging the individual turret cable into an overhead bus. Long cables would have created a hazard because of turret fixtures cutting the cables and causing short circuits. Testers working along the line would thus be subjected to risk of shock from the cut cables as well as the hazard of tripping over cables spread over the floor.

To overcome this problem, Leo Douville, tool design electrical group, working in conjunction with electrical engineers, devised a third-rail system. Chief problem encountered was the design of trolleys. It was necessary to provide positive contact at all times, while locating the trolleys so that they would not hinder the turret assembly and would not be exposed to damage. The system evolved differs somewhat from the conventional third-rail system in that the wheels are not tied into the circuit. The "third rail" in reality consists of two bus bars mounted side by side and covered with a welded steel guard (Fig. 1). The design also provides a means of mounting the trolley on the turret fixture (Fig. 2), eliminating the need of a track which would run completely around the conveyor system.

Floating Batteries

Since the current demand of each turret is extremely high at the start (compared to normal operation), special contacts and bus bars were provided. The power supply for the new system is a 500 amp generator with batteries "floating" on the line to compensate for large current demands when the turrets are started.

A unique feature is the automatic "make-and-break" set-up. Since the conveyor continually moves at slow speed, it is necessary that the contacts make positive connection with the bus at both the entrance and exit of the line. This prevents the contacts from burning in case the current is drawn at either end. The make-and-break is accomplished by means of a cam at the entrance and a solenoid operated by a micro-switch at the exit.

The new installation almost entirely eliminates the maintenance time that was formerly required to repair cables and connections. Another saving in production time results from the fact that it is not necessary for testers to walk from one end of the line to the other in order to get the necessary power supply cables, as was the case with the overhead power line.

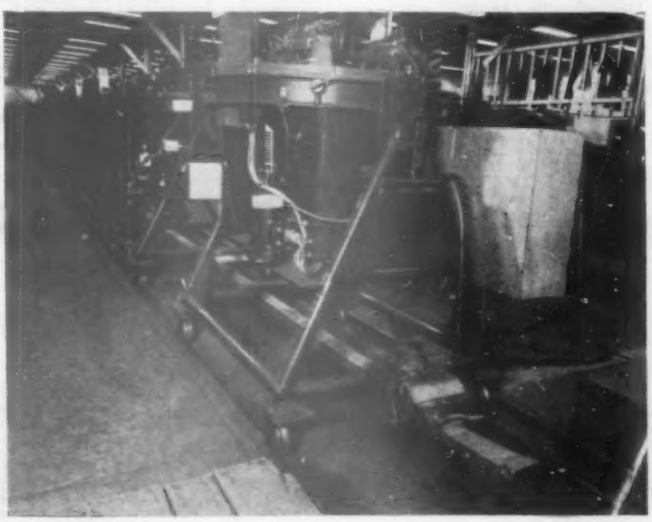


Fig. 2—The turret fixtures are weldments. They were fabricated by welding together tubing, structural shapes and forgings.

Welding Heavy Armor Decks

Warpage proved a tough problem in the butt welding of 1½ in. deck plates on warships. It was finally overcome by using jack-clamps before welding.

By J. S. WRIGHT

ARMOR plating on warships and new techniques of arc welding have advanced together since the beginning of the war. Welding heavy armor decks is no longer uncommon in naval construction. However, the welding departments in shipyards were confronted with a baffling problem of warpage when the first heavy decks were welded.

Butt welds of decks 1½ in. thick, Fig. 1, require numerous passes. Because of contraction in the weld metal, the deck warps a bit with each pass in the manner shown in Fig. 2.

This problem was finally solved by the use of numerous jack-clamps. These powerful jack-clamps turn the lips of the butt up before welding, as shown in Fig. 3.

The jack-clamps are used in pairs, as depicted in Fig. 4. One clamp faces left, and the other faces right. A saddle is welded near the edge of the plate, and a hook in the clamp fastens underneath the saddle. When the clamp is screwed down tightly, it brings the edge of the plate up. By using jack-clamps in couples, the edge of each plate is brought up.

Welding is now begun. As the work proceeds, the contraction in the weld metal causes the butt to warp downward. By the time the weld is finished, the lips of the butt have warped down so far that the deck is perfectly straight and level.

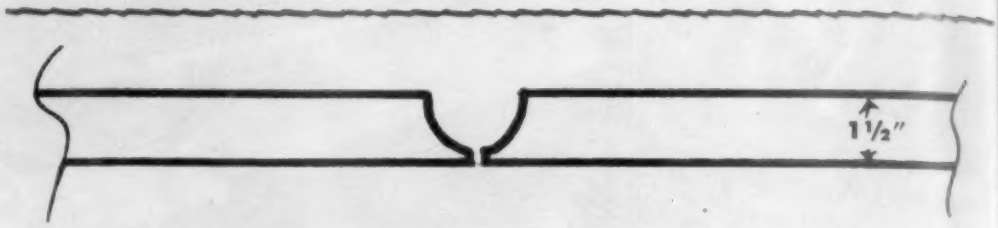


Fig. 1—Schematic diagram of 1½ in. deck plates prepared for butt welding.

Fig. 2—Contracting weld metal causes the plates to warp downward.

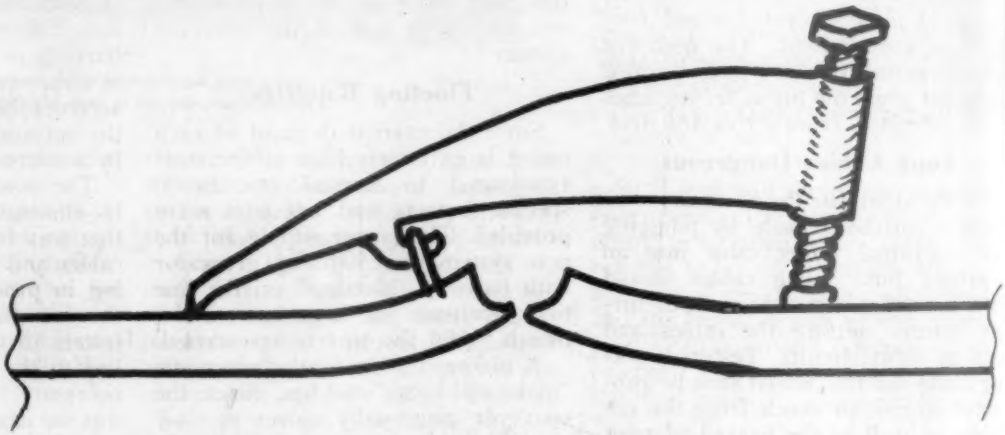


Fig. 3—The hook on the jack-clamp fits into a small saddle welded near the edge of the left plate. When the screw is tightened, the edge of the plate is raised.

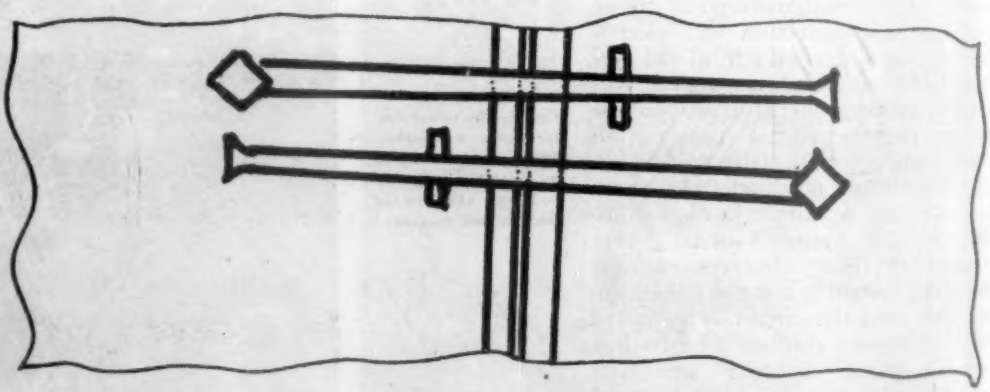


Fig. 4.—The jack-clamps are used in pairs so that the edge of each plate will be brought up prior to welding.

Welding Fittings Information

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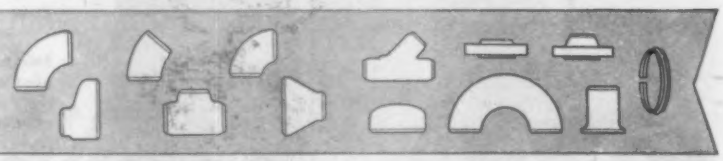


THE COMPLETE LINE OF WELDING FITTINGS AND FLANGES

Spot Welding Aids Maintenance

We hear a great deal about the use of spot welding in production, but what about its use by small shops for purely maintenance purposes? Here is one such job: the repair of aluminum cowling for Army training planes.

By **LEE BRADY**

WHEN the war made the training of thousands of liaison or observation pilots necessary, the job was frequently placed in the hands of civilian airport operators. The Army furnishes the planes, mostly second-hand, prewar Aeronicas, Cubs and similar aircraft. The contractor is required to furnish all maintenance personnel and to make all necessary inspections and repairs.

Most of the mechanics available for this work have been trained only in automotive repair work. In particular, the scarcity of skilled weldors, especially those capable of welding aluminum, constitutes one of the major problems. The task of keeping such planes up to Army standards is an onerous one.

Cowling Repairs Difficult

A particular example is furnished by a Kansas contract school engaged in the training of Army liaison pilots. One of the most troublesome of the many difficulties created by the shortage of experienced personnel and scarcity of replacement parts was the making of proper repairs on the aluminum cowlings of the training planes.

The cowlings are subjected to considerable hard usage. Each ship used in the training program must undergo a daily inspection as well as its regular 25 hour, 50 and 100 hour inspections and major overhaul. Constant removal and handling often causes the cowling to break or crack.

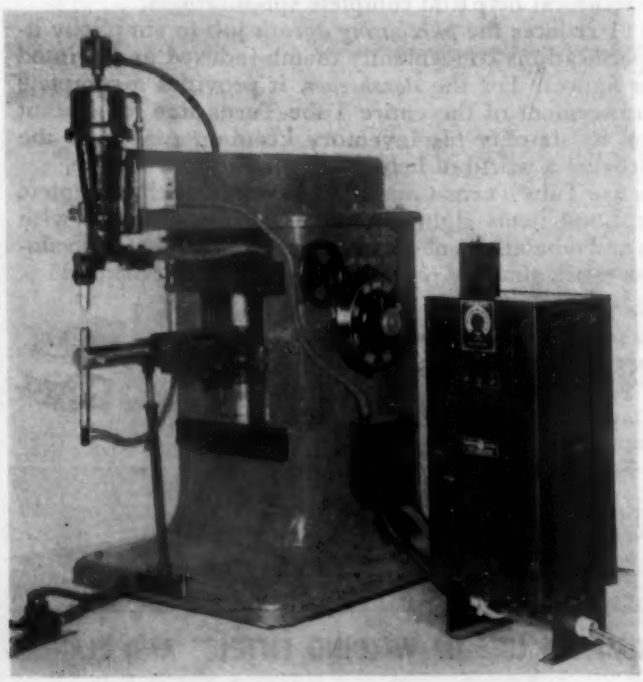
Various methods of repair were tried out, but none proved entirely satisfactory. Patches were riveted and then welded, but the results were not approved. To make the situation worse, inexperienced weldors completely ruined many cowlings while attempting to make the repairs.

Spot Welding to the Rescue

After a time it was decided to try spot welding. The only machine that could be secured, however, was a foot-operated welder (see picture), in which a foot switch actuates an electronic control. Since no experienced spot-welding operator was available, success in welding the cowlings had to be attained largely through the trial-and-error method. Through perseverance, however, the factors governing the success or failure of the spot-welding process were eventually found. Let us look at some of them.

Due to the high electrical conductivity of aluminum, a heavy current (high amperage) is necessary. Yet this can be applied for only a short period of time, or the resulting heat reaches the melting point of the cowling and causes it to collapse. The exact current and time had to be found, calling for some tricky figuring.

The surface resistance of the sheets had to be considered. The greatest amount of heat is generated by the current as it flows through the surface of the sheets at the point where they contact each other. To offset this condition the highest pressure possible was used for each job. Accurate power timing was found to be essential as well as the fact that the pressure of the upper electrode must be reduced as much as possible.



This is the spot welder used by a Kansas aircraft school to keep the cowlings of its training planes in satisfactory condition. Other maintenance uses have since been found for it.

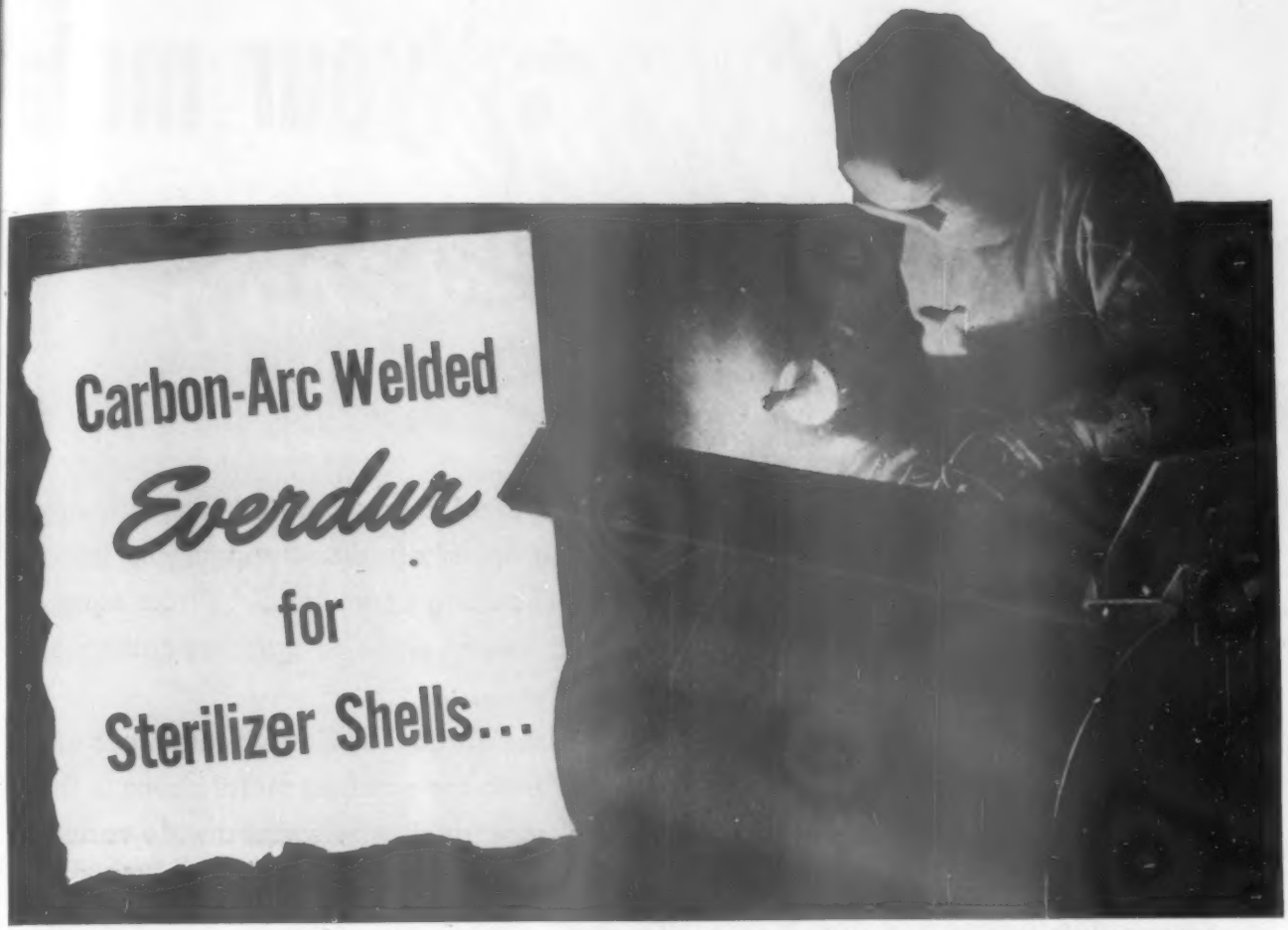
Since it is the amount of heat through the point to be welded that governs results, the time element proved to be all important. The extremely short time needed could be secured only through electronic control. The parts to be welded must be melted at the point of contact in fractions of a second, allowing only a small amount of heat to pass to the outside. If too much heat reaches the surfaces, the cowling will melt and the welding machine electrodes will imbed themselves in its plastic surface.

Aluminum retains its silvery appearance even upon reaching the melting point; consequently, the operator has no color change in the metal to indicate the approach of the danger point.

Current Problems

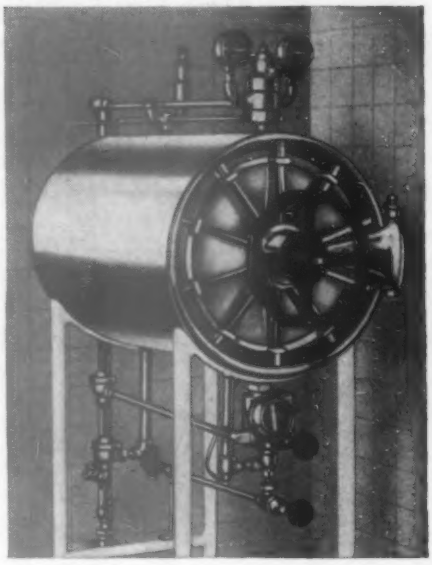
Determination of the correct amount of current also offered considerable difficulty. The secondary voltage has to be sufficient to push the current through the secondary circuit. The current flow is influenced by the inductive resistance of the secondary circuit. By constant practice it was found that the thickness of the aluminum that could be welded depends upon current frequencies. In addition to current problems, the type of electrodes and the proper timing of the machine had to be solved before perfect spot welds resulted. Once the proper settings had been obtained, however, the electronic control made it possible to duplicate the results over and over.

After the spot welder operator had acquired more skill, additional uses were found for the machine in welding other metals and parts. Spot welding has aided greatly in solving a small but vital problem in wartime maintenance. In the coming postwar period, greater and wider usage of the spot welder in maintenance will doubtless be developed to supplement the production fields in which it already plays such a prominent part.



Carbon-arc welding an Everdur sterilizer shell at American Sterilizer Company.

Below, the complete unit.



IN THESE DAYS of shortages and fabricating innovations, Anaconda Welding Rods are proving useful in solving production problems, as well as in repair and salvage welding. A typical example is the production welding job illustrated.

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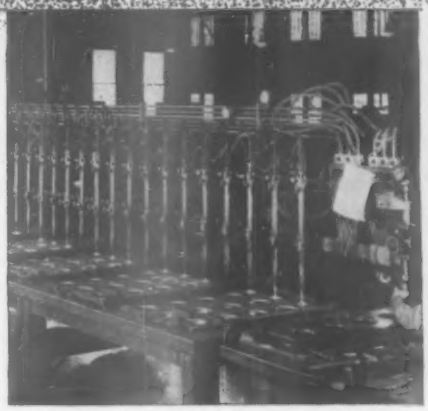
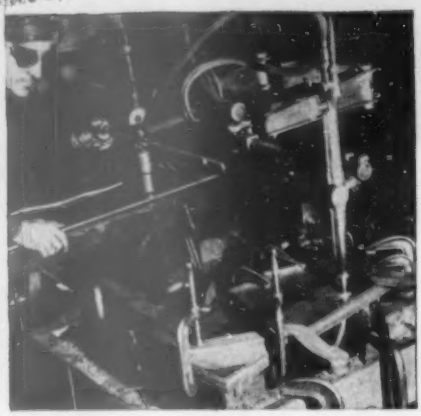


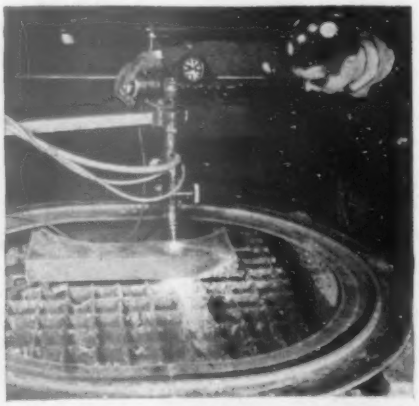
Large-area cutting and quantity production of small parts is speeded by the Airco No. 41 Travograph, a motor-driven machine which moves on a track located alongside the work. Multiple cutting torches are guided by a tracing device which follows a cam or template of the required shape.



Stack cutting small parts with the Airco Planograph. Identical parts of any design are accurately shaped in one operation by "stacking" the plates to any thickness within range of the cutting torch.

Pipe cutting and beveling simultaneously with the portable Airco No. 1 Pipe Cutting and Beveling Machine. This handy machine requires no power. It is operated by a crank which revolves the machine around the pipe. If desired, the machine may be held stationary while the pipe is revolved.

For fast cutting of small shapes the Airco No. 5 Camograph is ideal. It cuts parts of any contour by means of a motor-driven template roller which follows a metal template of the required shape. This in turn controls movement of the torch, and assures speedy, accurate cutting.



Continuous, curved bevel cuts and special symmetrical shapes are made with the Airco No. 10 Polygraph, a motor-driven machine that travels on a track which is also the template for the cut. The Polygraph is one of many Airco machines designed for special cutting operations.

Cutting Machines

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Help Speed V-J Day

A few of the many time and labor-saving ideas developed by institutions of the production line are presented every month in this department. If you have a good welding idea of your own to pass along, you are hereby invited to contribute it to the cause of final victory. Send anything you think suitable to: Short Cuts and Kinks, THE WELDING ENGINEER, 506 S. Wabash Ave, Chicago 5.

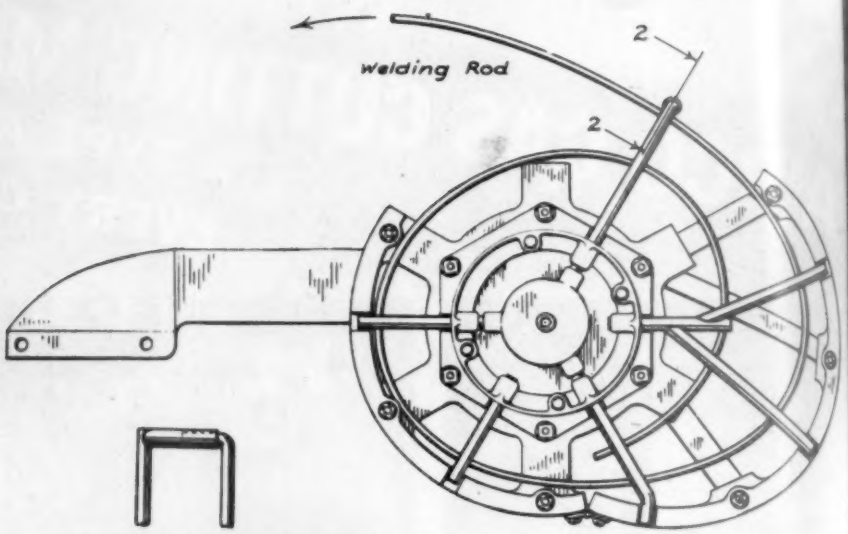
Flame-Cutting Crooked Plates

By Lawrence Van Gorder

AT THE Buckeye Traction Ditcher Co., Findlay, O., we were confronted with the problem of flame-cutting large crooked plates into smaller plates measuring ⅝ by 11 in. by 12 ft. 0 in. This task wasted much time as well as stock, so I suggested to the War Production Drive Committee an attachment which would make it possible to flame-cut bevels on crooked plates.

This attachment pivots the torch in the middle of the flame-cutting machine so that the weight is carried on a wheel resting upon the plate. As the wheel travels parallel to the line of cut, it follows along the contour of the crooked plate. This lowers and raises the torch automatically—a task which could not be readily accomplished by manual operation.

Workmanship has been greatly improved since this suggestion was adopted and put into use. Two cuts are saved on each plate, and oxygen and acetylene consumption is reduced by half on this particular operation. Time is also saved by cutting the handling of the plates in half. Likewise material is saved, since one piece ⅝ by 11 in. by 12 ft is gained every time 11 pieces are cut.



Modified reel for submerged-melt welding wire. Some of the spokes were elongated to permit the reel to handle enlarged and out-of-the-round coils.

» «

Expanded Wire Reel

By Robert B. Desmond and Ray A. Steiner

THE purpose of the suggestion we submitted to the Joint Labor-Management Committee at Oregon Ship was to eliminate the necessity of rewinding loose or untied rolls of submerged-melt wire before using it in production. The wire is delivered from the factory in coils, which are originally annular and tied. Unfortunately, the spring or elasticity in the wire coupled with more or less rough handling in shipping causes the coils to loosen. When this happens, they are enlarged beyond their original form and change from the circular form to elliptical.

A submerged-melt machine's reel is circular and has a complicated means provided for the insertion of new coils of wire. This reel defines the maximum circumference of the coil of wire which may be inserted. A coil larger than the prescribed diameter must be rewound and so must any coils in which the ties have become broken or loosened.

As originally constructed by the factory, the reel has two hinged halves and is made as a solid cage comprising a lateral rim carried by spokes. Our idea was to modify the reel by sawing the rim in half and cutting loose the spokes on one half. The two rim portions were then rigidly secured together, but some of the spokes were elongated by the use of inserts so that the cage was formed into an ellipse instead of a circle. The major axis of the ellipse was increased to about 18 in., while the minor axis remained at the original diameter of the reel—about 12 in.

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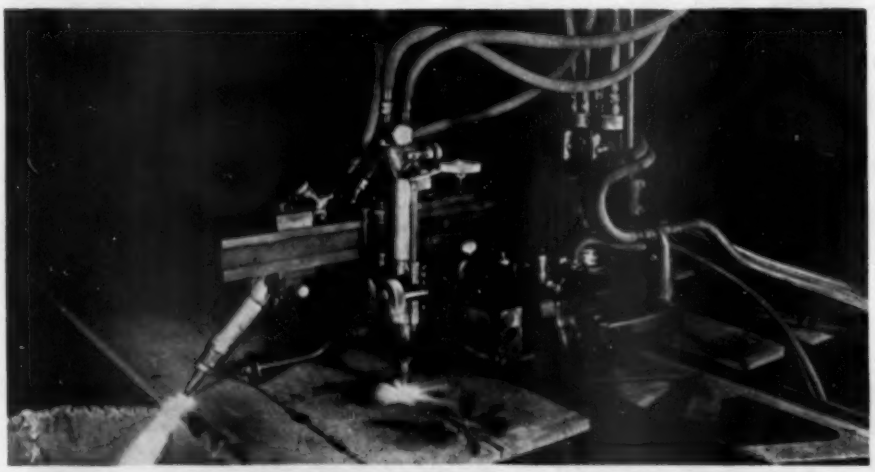

Attachment for flame-cutting crooked plates. The weight of the torch arm is carried by the wheel, which lowers and raises the torch automatically as it follows along the contour of the crooked plate.

Spatter Preventative

By Harry W. Moody

MOST electrode holders quickly become coated with slag and weld spatter; as a consequence they are burned and become useless in a short while. Reconditioning is then necessary. But holder parts are rather expensive, and it costs almost as much to recondition a holder as it does to buy a new one. It seemed to me that an effort to avoid spatter would be well justified.

I suggested to the War Production Drive Committee at Marinship, Sausalito, Calif. that the exposed metal parts and insulation on all electrode holders should be coated with a synthetic paint to prevent spatter from sticking and preserve the insulated parts. The use of this synthetic paint has eliminated much of the time and expense formerly required for reconditioning electrode holders.

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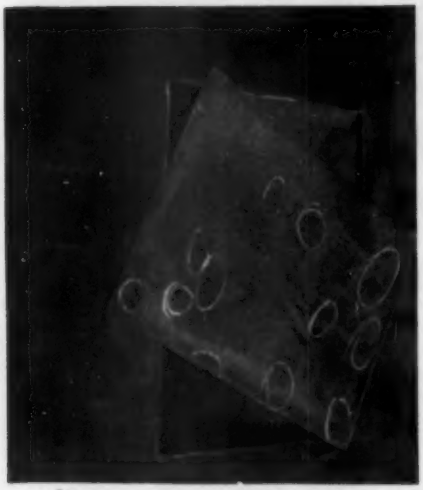
Maintenance on the Home Front

Boilers, oil tanks and tar kettles are some of the necessities for the home front which a St. Louis jobber is keeping in service by welding.



All photos courtesy, The Lincoln Electric Co.

Fig. 1—Pitted section of domestic fuel oil tank. This was flame-cut from the vessel preparatory to weld repair.

Fig. 2—The completed tank repair job ready for testing.

THE repair and fabrication of various essential articles for domestic use has turned out to be a major contribution of arc welding to the welfare of the home front. Typical of many welding shops is Lutke's Boiler Repair Co., St. Louis, Mo., where the variety of welding jobs completed daily attests to the increasingly widespread use of the electric arc to keep in service many kinds of structures which are now irreplaceable.

Oil Tanks

The repair of fuel oil tanks for home use, for example, accounts for a steady flow of business at this shop. Water, tending to collect at the bottoms of these tanks, usually pits the metal as shown by the chalked circles in Fig. 1. Before starting the weld repair, the tank is usually steamed out to remove oil fumes and thus prevent fire or possible explosion. The section of plate which comprises the pitted portion is then cut out with an oxy-acetylene torch as shown in Fig. 1.

A new section is cut so that it will overlap the cutout, and this patch is placed over the opening and lap welded as shown in Fig. 2. A $\frac{5}{32}$ in. mild-steel electrode is used.

The tank is then tested under 5 psi air pressure, applied through a coupling and tire valve. A soapy solution is spread around the joints so that the bubbles will warn of any possible faulty seams.

Boiler Repair

Another interesting application at the Lutke shop is shown in Fig. 3. This boiler for an apartment heating system is 12½ ft long. The entire mud ring, a rectangular shaped piece, was fabricated on the outside and slid under the bottom of the furnace. High plates measuring 9 in. were welded to the ring before inserting it in place.

The cutting torch was employed to cut out the old side plate at a height of 9 in. from the bottom, leaving the old cast base intact. A new bottom ring, 6 in. wide and $\frac{5}{8}$ in. thick, was then made and used as a replacement.

New outside sides measuring 9 in. high were cut from $\frac{3}{8}$ in. plate and fillet welded to the bottom ring. The section was then butt welded to the old bottom shell of the boiler.

Fig. 3—Butt welding inside plates of apartment house boiler to the old inside shell.

The inside plates were then fillet welded to the bottom ring and butt welded to the old outer shell on the inside. Holes were drilled in the inside plates to receive stay bolts, which were welded to the plates. All welding, both inside (Fig. 3) and outside, was made with two passes, using either $\frac{3}{16}$ or $\frac{5}{32}$ in. mild-steel electrodes. The entire repair was effected in about two weeks' time by one weldor and a helper.

Tar Kettle Manifold

A third Lutke job consisted of the repair of a tar kettle used in road construction work. An entire manifold had been burned out and required replacement. The completed job, with new manifold and flues in place, is shown in Fig. 4. The manifold is 8 in. in diameter, and the welded end plate is of 10 gauge steel.

To effect this repair, the weldor cut out the old burned-out pipe and fabricated an entirely new section. This welded piping assembly was installed in the kettle, and the open end of the new manifold was welded all around to the end plate. An insulated section that had been cut out of the shell to gain access to the manifold was then replaced with another section, welded over the opening.

Fig. 4—Welded tar kettle repair. The new heating manifold and flues have been installed, and it is only necessary to weld a patch over the opening cut to secure access to the manifold.

This Girl Is Wrapping Up a *New* PRODUCTION TOOL

In 1917, A. O. Smith developed a method of coating electrodes with paper, which shielded the welding arc and produced welds of materially improved ductility and tensile strength—a revolutionary advance in the relatively primitive art of welding.

Now in 1945, continuous welding research in A. O. Smith laboratories and plants makes possible the fabrication of 28,000-pound stern frames for cargo ships by the electric arc welding method—a process involving standard SMITHway electrodes and a mastery of modern welding preparation and techniques.

Soon... a Complete Line of SMITHway A. C. WELDERS

Ready for delivery soon, the expanded line of A. C. Welders includes three new models of 150- 200- and 250-ampere capacity, in addition to the HEAVY DUTY MODELS of 300- 400- and 500-ampere capacity. Write for complete specifications and prices.

The Proof Is in Production

Welding research never ends at A. O. Smith. It goes on in the laboratories. It goes on in actual daily production. Every day more than 320,000 SMITHway electrodes are used in A. O. Smith plants on parts and products ranging from the smallest and simplest to the largest and most complex. Millions are used in the plants of other manufacturers. For detailed specifications on SMITHway Certified electrodes and their application to specific welding jobs, send for the SMITHway Welding Guide.

Mild Steel... High Tensile... Stainless Steel
WELDING ELECTRODES
made by welders... for welders

SMITHway Certified WELDING ELECTRODES

A. O. SMITH Corporation

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On the Job

Metallizing Saves $1,968

By C. W. Reynolds

IN SIX weeks one of New York City's largest newspapers salvaged $2,110 worth of worn equipment by metallizing at a cost of only $142. The total saving was thus $1,968. The salvaged equipment consisted of ten 94½ in. unit upright drive shafts, a fountain roller and a top folder horizontal shaft.

The upright drive shafts were badly worn and would have had to be replaced at a cost of $1,850 if it were not for metallizing. On each shaft, the new metal was sprayed over a bearing surface 24½ in. long. This section of the shaft has three diameters: 2⅞, 2.75 and 2.756 in. There are two keyways on the 2.75 in. diameter section. The opposite end of the shaft is 2½ in. in diameter; here an oil groove, 1¼ in. wide, was sprayed.

The shafts were prepared for metallizing by the conventional rough threading method. Dummy carbon keys were inserted in the keyways to a height of approximately ⅛ in. above finished size (see bottom picture). After machine finishing, the dummy carbon key was broken up and removed, leaving perfect edges along the keyway sides.

The total spraying time per shaft was 1 hr. 50 min. An average of 9¾ lb of 0.10% carbon-steel wire was used on each shaft at a cost of $1.60. The cost of the acetylene, oxygen and compressed air totaled $6, and a labor cost of $6 brought the total cost of preparation, spraying and finishing on each shaft to $13.60.

The fountain roll, 80 in. long by 5 in. in diameter, had been worn at the journals on both ends. One journal is 1½ in. and the other 1 in. in diameter; both are 2 in. long. The same preparation, finish and 0.10% carbon-steel wire were used as on the upright drive shafts. The cost of the salvage job complete, including labor, gases and wire, was $4.25. A new fountain roll would have cost $200.

The top folder horizontal shaft measures 63½ in. long with set-ins. The section sprayed was for a ball-bearing fit 1½ in. long. The cost of the salvage was $1.75; a new shaft would have cost $60.

Another large New York City newspaper reclaimed worn paper nips by spraying them with stainless steel to an oversize of 0.015 in. They were then machined to size. Spraying, finishing and preparation cost $4.50; new nips would have cost $40.

Courtesy, Metallizing Co. of America

Above: Spraying the bearing surface of the upright drive shaft. Right: The shaft rough threaded in preparation for metallizing; note the dummy carbon keys.

Beachhead Repair Units

By S. Craig Cairns

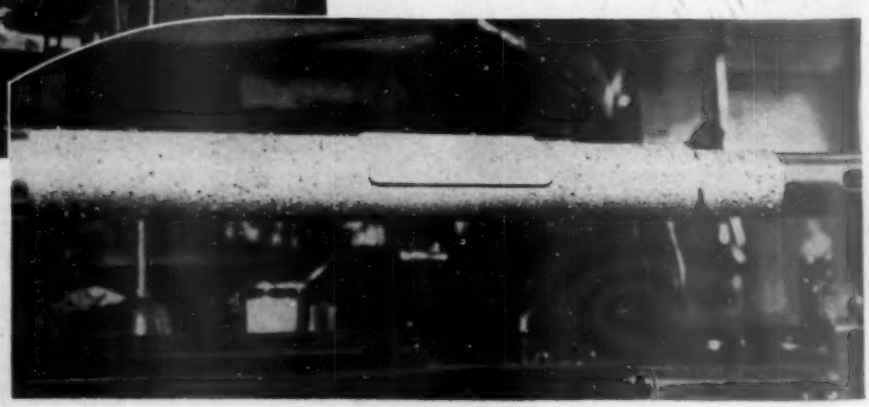
THE Bureau of Ships went into a huddle with the Philadelphia Navy Yard, and the result of their combined efforts to keep battle-damaged amphibious equipment from piling up on the beaches as junk is the Unitized Repair Base, now being assembled at the Thornton-Fuller Co. plants in Philadelphia.

A complete Unitized Repair Base consists of seven separate skids or sleds holding the equipment for seven portable "shops"—machine shop, hull repair shop, engine and transmission repair shop, utilities shop, spare parts shop, consumables shop and retriever. The welded skid bases or pallets measure 11 ft 10½ in. by 6 ft by 6 in. each and are reinforced by five transverse 4 by 4 in. box girders and two longitudinal 6 by 6 in. skids. Hinged extensions on all four sides provide additional floor space, and a waterproof canvass roof is spread over a steel pipe frame welded to the pallet.

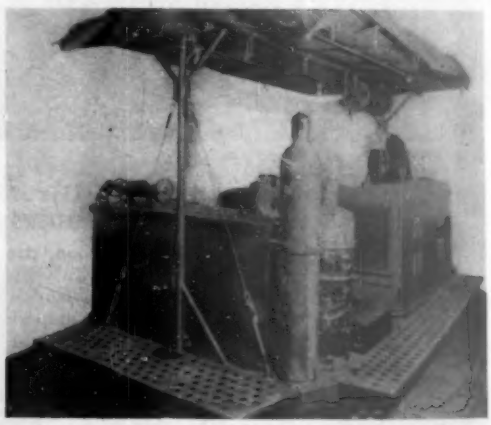
The repair bases fit into the well of an LVT (landing vehicle, tracked) so that they can be dragged out and onto the beach when the landing ramp is lowered. The ends of the vertical staunchions of the framework are flattened and pierced to serve as lifting eyes when a boom lift is necessary.

The utilities shop maintains radio communication with the combat units and with the retriever as it scours the beachhead searching for stalled equipment.

The hull repair shop, as its name implies,



Below: Hull repair shop—one of the seven units making up the new Unitized Repair Base designed to facilitate amphibious operations.



Courtesy, The Hobart Brothers Co.

has the function of repairing and salvaging knocked-out landing and supply ships. This skid carries a 300 amp, 40 volt gasoline-driven arc welder, a gasoline-driven air compressor with a 5 kw generator as a source of auxiliary power, a portable oil-burning blacksmith's forge and anvil mounted on a portable block, complete oxy-acetylene cutting and welding gear, welding cable, helmets, gloves, and attachments as well as pneumatic chipping and scaling hammers, heavy files, pliers, drills, grinders etc. The heavy load of accessory equipment and consumable supplies necessary for LVT repair operations is carried in the spare parts and consumables shops.

The retriever unit is designed to salvage under all conditions, on shore or afloat, and to salvage entire LVT's or their parts when they cannot be brought up to the landed shops under their own power. Its equipment consists of a winch capable of effecting a lift of 1,500 lb or a towing pull of 20,000 lb, a salvage pump, fire-fighting equipment and a 200 amp arc welder. Underwater arc-cutting equipment and shallow water diving gear are also carried. By this means, engines and other vital parts can be cut loose and salvaged from sunken craft, or such craft can be temporarily repaired, floated and then towed to the beached shops.

Expressing his satisfaction with the trial performance of the several units, Admiral Edward L. Cochrane, Chief of the Navy's Bureau of Ships, said of the Unitized Repair Bases:

"Their job is to serve the amphibious forces at the height of battle when speedy repairs are most essential and before there has been time to set up any of the permanent repair bases. They have been designed so that the entire cost is slightly more than that of one amphibious tractor. Thus the entire base has practically paid for itself when the first LVT which would otherwise be lost is rescued and repaired."

» «

Motor Stator Repair

By Chester L. Wright

THE 50 hp motor stator shown in the picture below had one foot broken off, which rendered the motor unfit for further service. A little arc welding and a couple of hours of welding time put the stator back in use as good as new.

Arc welding was called upon to repair the broken foot of this 50 hp motor stator.

Double Deoxidized
Welding Rod

AN *Exclusive* TITAN PRODUCT

Double Deoxidation eliminates one of the most serious hazards incident to welding—the presence of occluded or dissolved gases within the rod itself, and the possibility that gases will be absorbed from various sources during the welding operation.

You will have none of these troubles when you weld with Titan Bronze Rod. You will secure free permeation of smallest cracks and seams, and a finished job that will be sound, strong, non-porous and highly ductile.

Informative Literature

Titan Welding Rods are available in various Bronze alloys providing for practically any welding requirement. Write for Titan literature on this subject which approaches from the angle of Welding Rod characteristics and also welding job requirements. Metallurgical assistance if desired.

Titan

METAL MANUFACTURING CO., BELLEFONTE, PA.
Sales Offices:
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Quality Alloys By Brass Specialists
Brass and Bronze Rod • Forgings • Die Castings • Welding Rods

Cargo Vessel Engine Exhausts

A series of ingenious factory procedures has been developed by the Weber Showcase & Fixture Co., Los Angeles, for the fabrication of engine exhausts for cargo vessels. Basically, this work consists of press forming two halves of an elbow and joining them by arc welding.

A sheet of ⅜ in. steel plate, measuring 9 by 6 ft, is first flame-cut to a pattern fitting the shape of the elbow to be formed. The cut sheets, weighing approximately 300 lb each, are swung one at a time into a blast furnace and heated for 15 minutes at a temperature of 1,400 F. Leaving the furnace, they are placed on the face of a female die of a nearby hydraulic press.

Under a pressure of 400 tons, each sheet is pressed into a rough shell which represents one half of the elbow. At the cutting table, a portable pantograph-type cutting machine travels in a circular track around the curved edges of both sides to trim them to the correct dimensions. The torch then makes another complete trip and bevels the edges for welding.

Welding together the two formed halves of an engine exhaust for an EC-2 cargo vessel. Note the screw-type jack which holds the edges in alignment.

Courtesy, The Hobart Brothers Co.

A somewhat unusual method is used to clamp and draw the edges into position. After preliminary tacking, the operator welds two small brackets to the elbow, one on either side of the seam. A push-pull, screw-type jack is fastened on these brackets and used to draw the seam into a snug position and hold it firmly in place until the welding has been completed.

After two welding necks have been added to its ends, the 25 in. diameter welded elbow is ready for installation in an EC-2 cargo ship.

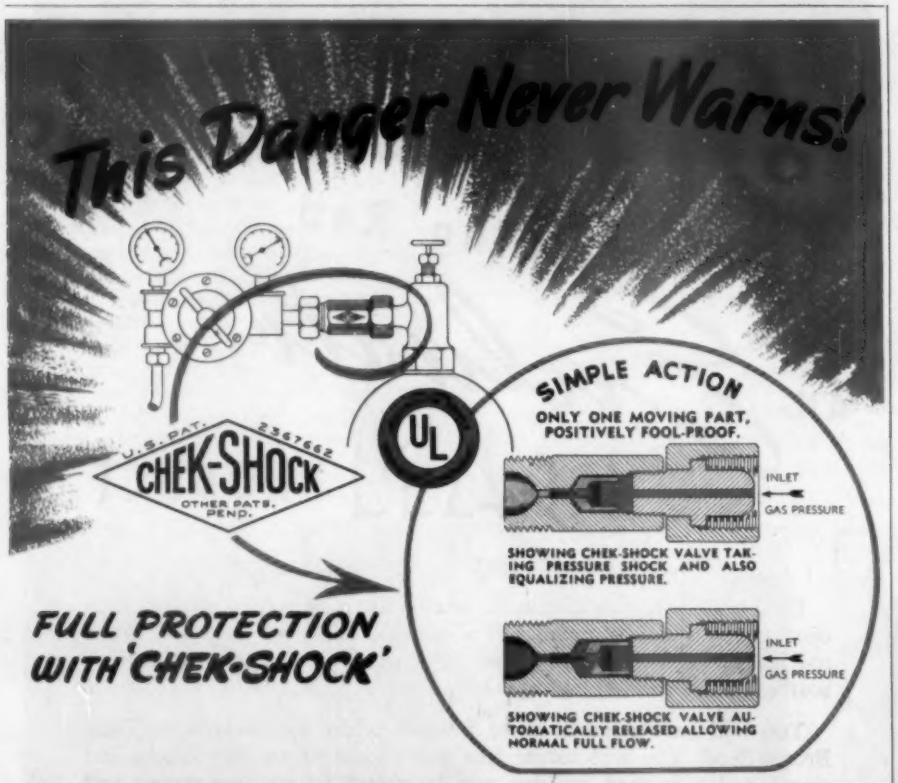
» «

Nancy the Weldor

Delicate "gun" parts are spot welded together in assembling of cathode-ray tubes.

Nancy Bonacci—the attractive young lady shown in the picture—performs an important war job at the Dobbs Ferry, N. Y., plant of North American Philips Co., Inc. Using a small bench welder, she spot welds "gun" parts together for athode-ray tubes.

The tube's gun assembly shoots electrons at a phosphorescent screen, causing it to fluoresce. Huge quantities of cathode-ray tubes go directly to the Armed Forces and to war industries. Spot welding and Nancy's skillful fingers make mass production possible.



CHEK-SHOCK OXYGEN CUSHION VALVE

SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.
- Will increase life of regulator assembly.
- Will eliminate possible injury to operator from burstings.
- Will prevent unnecessary internal wear in regulator *(as NOT necessary to release control screw before opening tank valve).*

This PROVEN automatic safety device cushions the initial "blast" of pressure when tank valve is turned on, (this uncontrolled surge which strikes like a hammer is the direct cause of most damaged regulators and accidents), when pressure slowly bleeds and equalizes then CHEK-SHOCK allows a full flow of oxygen.

PRICE IS LESS THAN ONE REPAIR BILL

1. STANDARD COUPLER—for all standard size welding type oxygen regulators.
2. LIGHT COUPLER—for "airplane" or soldering size oxygen regulators.
3. HEAVY DUTY COUPLER—recommended for extra heavy duty work only.
4. SCREW TYPE COUPLER—for removable inlet stem regulators (¼" pipe) available in standard, light, or heavy capacities.

$6.00 ea.

5. FOR HYDROGEN—left hand thread coupler. We also make Medical Chek-Shocks for all types of medical regulators and tank fittings (chrome plated).....$7.00 each

SEE YOUR DISTRIBUTOR OR WRITE

Chek-Shock MFG. CO.

FOWLER CALIF.

Two brazing operations are required for each gas-type circulating water heater, joining the inner and outer coils to the two pipe castings—make four Phos-Copper joints in each.

NOW...3200 JOINTS PER DAY BRAZED WITH PHOS-COPPER

...a tip to design engineers!

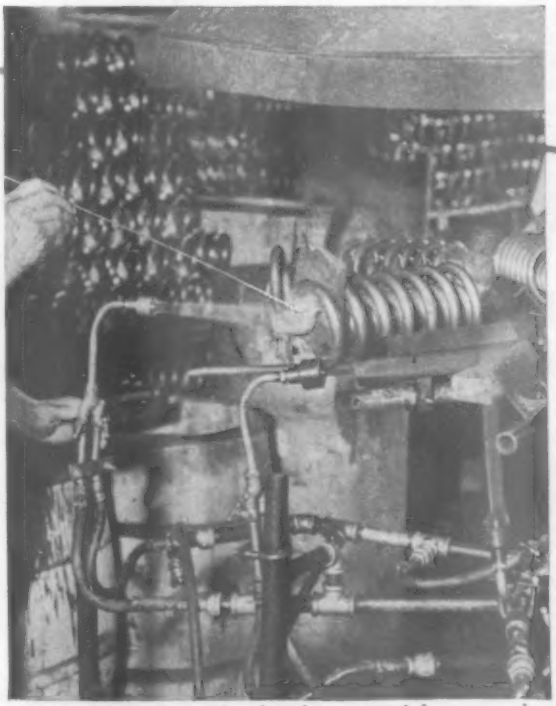
You get high production speed—and eliminate costly machining time—when you use Phos-Copper brazing. With this process, many cast and machined parts are being replaced by structures built up from simple, easily produced components.

With Phos-Copper brazing of copper, bronze and brass, tests have shown joints stronger than the parent metal...corrosion resistance equaling the parent metal . . . electrical conductivity 98% as great. Its low, free-flowing temperature permits the brazing of light sections.

Phos-Copper brazing may be done in any of five ways—by gas, incandescent carbon, dipping and electronic heat and in a furnace. Phos-Copper comes in rod, strip and special shapes.

Because of the many advantages, Phos-Copper is replacing tin and silver-base solders. For further information on Phos-Copper, ask your Westinghouse representative for book B-3201. Or write for it, to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-90536



The coil being brazed has just been rotated from two other positions where gas flames preheated the joints. The flame at the brazing position maintains the heat and flows the 1/16-inch Phos-Copper rod. The ten-position rotating fixture produces 1600 brazing operations of two joints each, or 800 coil assemblies per shift.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Phos-Copper Brazing

New Products to Use

Magnetic Straight-Edge

★ Manual flame-cutting, particularly vertical and overhead, is said to be greatly facilitated by the magnetic straight-edge developed by the **B & W Co.**, 7610 S. Figueroa St., Los Angeles 13. An 18 lb

Vertical flame cutting is greatly facilitated by the "B & W" magnetic straight-edge. The tip is both guided and held at the correct cutting distance from the work.

pull holds the contacting magnets firmly to the work, no matter whether the plate is rusted, oily or painted. The magnets are not affected by electricity and are said to last for years. The straight-edge itself is made of a heat-treated aluminum alloy, rigid and lightweight, that will not warp from heat and will resist corrosion. It both guides the torch tip and holds it at the correct distance from the work, assuring uniformly clean and accurate cuts. Adjustment to any desired bevel angle is readily made.

Three models are offered, in lengths ranging from 18 to 36 in.

» «

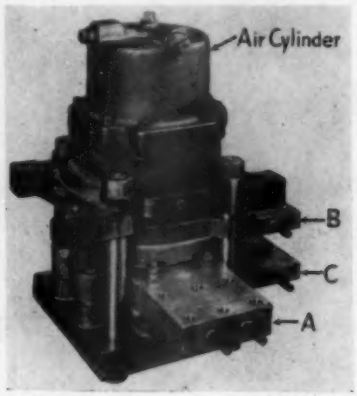
Hard-Facing Electrode

★ Hobart "Tufanhard" is a heavily coated hard-facing electrode which can be used in all positions on either a-c welders or d-c, straight polarity. It is as easy to use as mild-steel rod, claims manufacturer; continuous overlapping beads can be made without removing slag, and the low spatter loss and bead smoothness will necessitate only a small amount of grinding in finishing. The deposit can be heated and drawn to any temper within the range of the rod type used.

"Tufanhard" is made in three grades—"600," "400" and "250"—corresponding to the Brinnel hardness of the deposited metal. Electrodes are made in 1/16, 5/32, 3/16, and 1/4 in. diameters. **The Hobart Brothers Co.**, Troy 1, O.

Contactor-Controller

★ Design and construction details of the contactor-controller which has made pos-



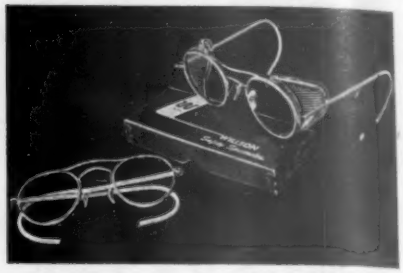
Carbon-pile contactor for battery-powered resistance welders. The centrally located contact plate "A" faces similar carbon discs mounted on "B" and "C".

sible successful storage-battery-operated resistance welders have been released by **Progressive Welder Co.**, 3050 E. Outer Drive, Detroit 12. These contactors make possible the rapid interruption without arcing of welding currents ranging up to 30,000 amp. According to manufacturer, no sparking can be seen between the discs as the current is broken—only an occasional glow from a speck of heated carbon dust.

The contactor utilizes the principle of the carbon-pile rheostat, in which the current flowing through a circuit is controlled by varying the pressure applied to a stack of carbon discs. Maximum current, of course, flows when the carbon is most highly compressed. The current passes from two large carbon discs into a third one located centrally between the other two ("A" in illustration). The carbon surfaces at the top and bottom of the central contact plate face similar carbon discs mounted on the upper and lower contact plates ("B" and "C"). The contact surfaces are separated by space of a few thousandths of an inch. As the contacting surfaces are brought together, they offer at first considerable resistance to the flow of the current. As air pressure up to several thousand pounds is applied, the resistance rapidly drops until it reaches a minimum under full pressure. To interrupt the welding current, the air pressure is removed, allowing springs to separate the contacting surfaces. The resistance then increases rapidly until practically no current remains to be interrupted.

Safety Spectacles

★ A complete line of safety spectacles in a range of sizes to fit every face is offered by **Willson Products, Inc.**, Reading, Pa. The frames look exactly like ordinary prescription spectacle frames,



Willson safety spectacles. The safety lenses may be ground to prescription.

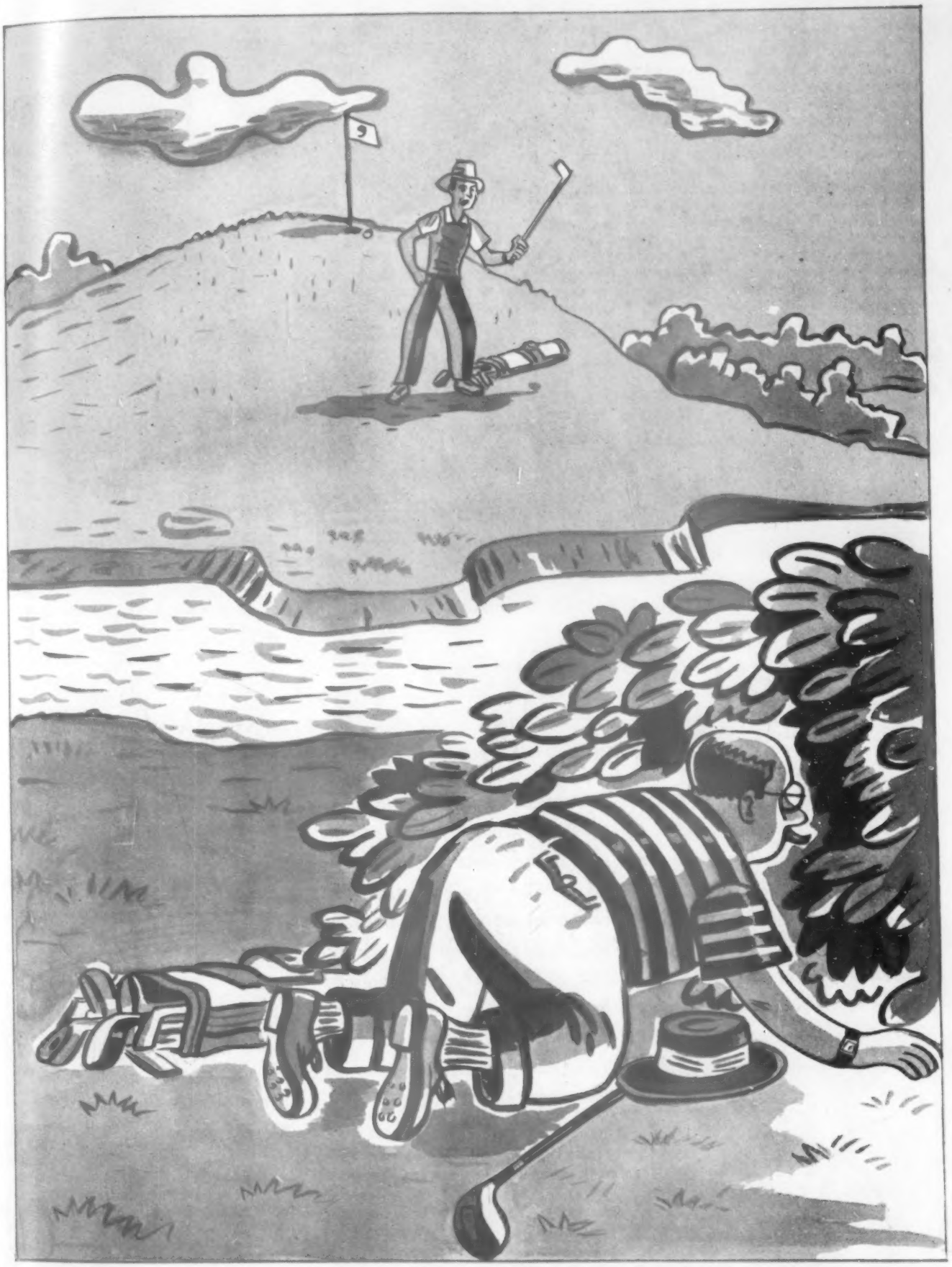
and the "Super-Tough" safety lenses may be ground to prescription if desired. Clear flat lenses, 1.25 or 6 curve, or flat green glass in four shades may be obtained. Every lens is individually tested for impact strength and optical clarity. The spectacles are available with or without side shields; ten types of side shields in clear or green plastic, wire mesh or leather are supplied. Self-adjusting plastic rocker nose pads and adjustable cable temples assure a comfortable fit. Any type of face—long, short, pointed, oval, round, blunt or angular—can be fitted by one of the 20 different frame sizes.

» «

Spot Welder

★ A new rocker-arm, air-operated spot welder embodying a number of simplifications and refinements has been brought out by the **Precision Welder and Machine Co.**, English and Neave Streets, Cincinnati 4. Among its features are unit construction and easy accessibility.

"Precision" rocker-arm, air-operated spot welder. A new product made by a new company.



"I CAN'T FIND THE BALL, BUT HERE'S SOMETHING BETTER—A BRAND NEW BOX OF **CHAMPION WELDING ELECTRODES!**"

Hard-Facing Electrodes

★ "Rexaloy" hard-facing electrodes are featured by a metallic coating which forms no slag. Another advantage is that they will perform satisfactorily on either a-c or d-c machines (straight or reverse polarity), in all positions.

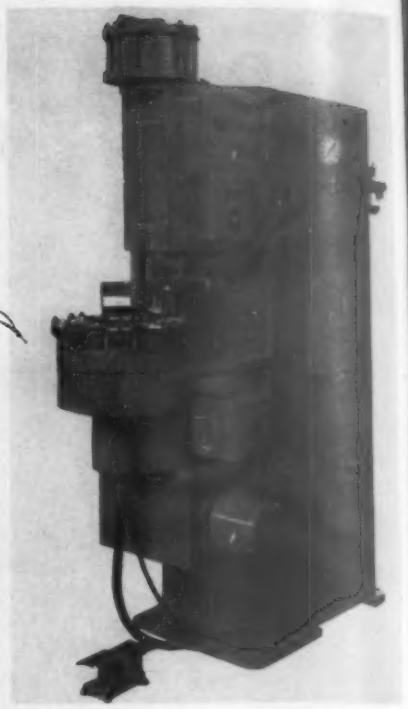
The coating is composed of varying amounts of chromium, nickel, copper, vanadium, manganese and other metals, which blend with the core rod during the welding to form a dense, slag-free alloy overlay. Elements often lost while passing through the arc are thus replaced, states manufacturer. The deposits are designed for toughness rather than hardness and will retain their original Brinell hardness of 300 to 687 (depending on the base metal) within a few points throughout their use. Deposits can also be forged and heat treated.

Rexaloy electrodes are made in 1/8, 5/32, 3/16 and 1/4 in. diameters and in six types: Nos. 30, 48, 50, 55, 65 and Manganese. These are described in a four-page bulletin, "Rexaloy Overlay Electrodes," available from **The Sight Feed Generator Co.**, Richmond, Ind.

» «

Press-Type Welder

★ By a unique arrangement of the secondary circuit, states manufacturer, this press-type projection welder welds two assemblies simultaneously with precisely the same amount of current and even less power demand than would be required to weld one assembly. The two welds are made in series simultaneously.



Taylor-Winfield ER-12-150 dual head, dial feed press welder.

The single air cylinder is connected to two heads through an equalizer bar which insures identical pressures on the two welding dies. The heads are of the square quill type and are mounted side by side in a common slide. The dies are connected to the two pads of the transformer secondary by flexible copper bands. As a result, the inductive loop of the secondary is reduced to a minimum, and maximum power factor and efficiency are obtained. Troublesome sliding secondary contacts have been wholly eliminated.

Indexing of the dial is obtained by use of a Geneva motion, motor-driven through a suitable gear arrangement. Correct sequence operation of the welding head is insured by a drum switch of the adjustable fan cam type, which permits welding only during the locked interval. **Taylor-Winfield Corp.**, 1052 Mahoning Ave., N. W., Warren, O.

» «

Thermit for Steel Castings

★ A special type of thermit for producing steel castings has been developed by Metal and Thermit. This material, "Thermicast," is intended only for castings and is not suitable for welding purposes. The thermit reaction is carried out in a special conical-shaped crucible of sheet steel lined with refractory material. As cast, Thermicast steel has an average yield point of 39,500 psi, tensile strength of 70,200 psi, 30.1% elongation in 2 in. and 51.2% reduction in area. **Metal & Thermit Corp.**, 120 Broadway, New York City 5.

Close Regulation

● IMPORTANT IN ARC-WELDING

● PROVIDED BY PIERCE GOVERNORS

● Pierce Precision Flyball Governors provide exactly the kind of accurate regulation—within extremely narrow limits—that good arc-welding demands.

That is the reason Pierce Governors are original equipment on many of the finest engine-driven welders—and preferred equipment on many "home-made" welders.

Pierce Governors act on the time-proved centrifugal principle to deliver greater accuracy for a longer period of service without trouble or readjustment. They are instantly responsive and unfailingly dependable. Specify Pierce Governors for the new welding equipment you buy—and write for the Pierce catalog if your present engines are not Pierce equipped.

THE PIERCE GOVERNOR COMPANY, INC.
1607 OHIO AVENUE • ANDERSON, INDIANA
Manufacturers of
Pierce Precision Governors and Sisson Automatic Chokes

PIERCE GOVERNORS

Electrode for Cast Iron

★ A machinable cast-iron welding electrode known as "Nickel-Arc" has just been added to the lines of stainless-steel and tool-steel electrodes manufactured by **Alloy Rods Co.**, York, Pa. "Nickel-Arc," states manufacturer, may be used with either a-c or d-c machines and in all positions. No preheat is required to obtain deposits that are completely machinable in the weld deposit fusion zone. The weld deposit is also said to be homogenous, free from cracks, porosity or cross checking in multiple-pass welds and to match closely the color of the parent cast iron after it has been machined or ground.

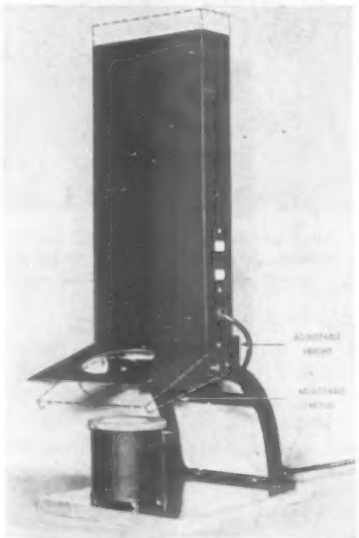
» «

Low-Temperature Alloy Sprayer

★ An alloy sprayer for the precision spraying of low-temperature metals and alloys is announced by the **Alloy-Sprayer Co.**, 602 First National Bldg., Ann Arbor, Mich. This new sprayer is being used particularly for the production spraying of selenium rectifier cells, rectifier discs, for protective coating of wood patterns, etc. Its range of operation is from 100 to 600 F, under air pressure of from 20 to 60 psi.

Model FP is designed primarily for spraying vertically downward, being suspended on a chain or similar support (see picture). It can also be swung out to spray almost horizontally. The application of the alloy or metal can be made in three stages: fine spray, coarse spray, pour. In addition, the degree of fineness and the degree of coarseness of spray in each stage can be varied by means of an adjustable needle valve. Both spray stages are accomplished with air pressure, but the pouring is done with the air pressure entirely cut off.

Model FP alloy sprayer for melting and spraying metals and alloys in the 100-600 F range.



"SSII" soldering stand. The operator views the work through a plate glass window or magnifying glass and is protected against fumes.

» «

Soldering Stand

★ The new "SS11" soldering stand is featured by an adjustable hood and a fume stack. It can be used for soldering with either iron, torch or soldering pot. It permits interchangeable soldering, protects the operator against injurious fumes. The hood is fitted with a plate glass window (or magnifying glass), while its underside is finished in white to reflect all of the light possible. The fume stack is 3 by 9¼ by 32 in. high. **Ess Specialty Corp.**, 96 S. Washington Ave., Bergenfield, N. J.

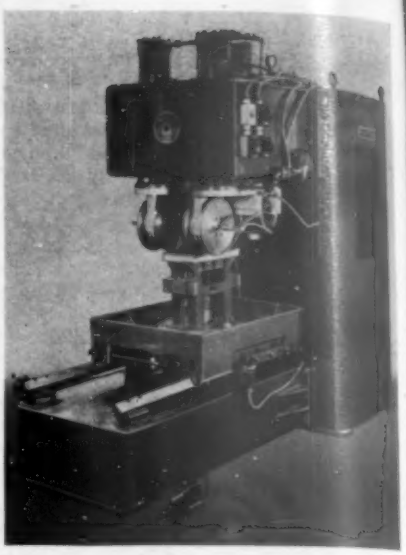
KNOCK-OUT
Better Repair Means Longer Wear!
Knock-Out
A·C ARC WELDERS
During these days when repair and maintenance mean so much to the individual and to the nation, you can't be too careful in selecting equipment that is proven and dependable.
K-O Engineers have placed a six year guarantee on their Welders. We know of no other welder manufacturer who has that much confidence in his product!
AMPERES
IT'S NEW JUST OFF THE PRESS
K. O. LEE COMPANY
K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA
Gentlemen:
Please send me your New Welder Literature Booklet No. 41-85
Name
Street
City
State

Duplex Seam Welder

★ Simultaneous seam welding of two or more parallel seams on one surface is made possible by a new line of Progressive "Duplex" seam welders. The duplex head accommodates either two or four welding wheels. The model pictured has two seam-welding wheels on each of the two welding heads. The outer wheels are of larger diameter to provide clearance for the inner wheels while the outside wheels are being used for welding.

All of the wheels are free rotating. They are driven by contact with the moving work under welding pressure. The work itself is carried on a moving table mounted on horizontal slide rails. The top of this fixture is a flat copper plate which provides the lower electrode for both wheels. Welding wheels, lower electrode and welding transformer are all water cooled.

Operation is completely automatic. When the operator depresses a foot switch, the table moves forward, the welding heads depress simultaneously at the proper point and the outside pair of wheels makes two parallel seam welds. The head rises while the rotary table indexes—turning through 90 deg—and the inside wheels then weld. Thus two separate pairs of seam welds at right angles to each other may be produced. The fixture indexes a second time back through 90 deg, and the table stops at the loading position. Conventional timing and sequence controls are used.



Progressive "Duplex" seam welder. It is designed for high production seam welding of parts requiring two or more seam welds on one surface.

These seam welders are available with transformer capacities up to 500 kva, in a wide range of work table sizes and travels, and with many combinations of welding wheel diameters and spacings. **Progressive Welder Co.**, 3050 E. Outer Drive, Detroit 12.

» «

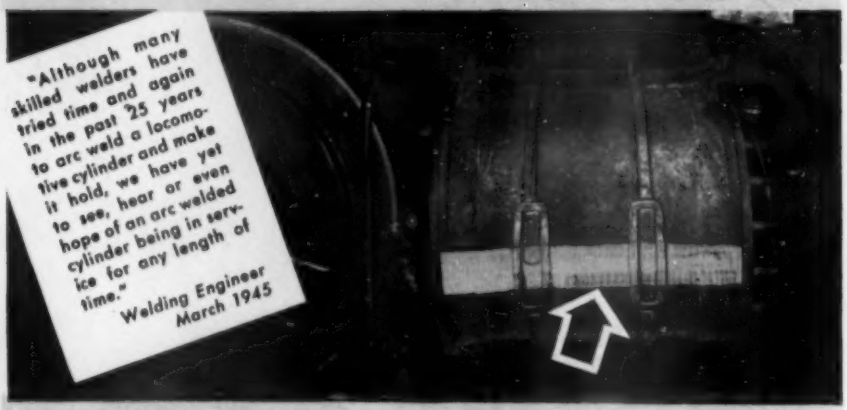
Goggle Cleaning Station

★ This goggle station is a self-contained steel cabinet designed for applying a spray of liquid cleaner to dirty goggles. The cabinet is connected to the plant's air line. It holds a refillable quart jar of "Sani-Spray" cleaner, a supply of tissue paper and a built-in receptacle for used tissues. Pressing a button releases a fine mist of cleaner from an orifice on one side of the cabinet. The fluid both cleans and fog-proofs goggles, eliminating the nuisance of moisture-clouded lenses. **Allen Optical Co.**, Buffalo 2.

Allen goggle station. Pressing a button releases a spray of liquid cleaner designed specifically for optical use.

(Please turn to page 80)

THEY SAID IT COULDN'T BE DONE— BUT WE DID IT!


"Although many skilled welders have tried time and again in the past 25 years to arc weld a locomotive cylinder and make it hold, we have yet to see, hear or even hope of an arc welded cylinder being in service for any length of time."
Welding Engineer
March 1945

THIS CYLINDER WAS SUCCESSFULLY ARC WELDED IN SANTA FE's LOS ANGELES SHOPS, 6 YEARS AGO

WITH EDCO YELLOW-SHIELDED PHOSPHOR BRONZE ELECTRODES

It is only one of many cylinders in use today, repaired by EDCO ELECTRODES.

Welding Time, approximately 8 hours. Cylinder did not have to be dismantled. No preheating was necessary. Less stresses on cylinder wall.

To do this same job by gas welding would have necessitated the removal of the cylinder bushing, building a fire inside the cylinder to preheat, replacing the bushing when weld cooled, testing the cylinder, *plus approximately 30 hours of continuous welding time.*

This is only one instance of what is being done daily with EDCO ELECTRODES in the repair and maintenance of railroad equipment. EDCO ELECTRODES are a perfect combination of the best phosphor bronze and high quality shielding. With the proper application this combination is unbeatable. For economy, speed and long-wear on your biggest repair jobs—specify EDCO ELECTRODES.

SOLE MANUFACTURER
ECCLES & DAVIES MACHINERY CO., INC.
1910 Santa Fe Avenue, Los Angeles 21, Calif. • Distributors in all principal cities

Induction and Dielectric Heating Selection and Application*

RADIO-FREQUENCY heating may be used for brazing, soldering, annealing, surface hardening, spinning, extruding, sintering, drying, dehydrating, sterilizing, curling, thawing and setting. The generators used for these heating operations may be divided into two categories, defined as follows:

1. **Induction Heating**

   "The heating of a nominally conducting material due to its own I^2R losses when the material is placed in a varying electromagnetic field."

2. **Dielectric Heating**

   "The heating of a nominally insulating material due to its own dielectric losses when the material is placed in a varying electrostatic field."

Advantages

Rapid, uniform, controlled heat processes such as induction or dielectric heating offer the following advantages:

1. Instant availability. Power is turned on or off by pressing a button; no waiting for the furnace to heat up or cool off.
2. Complete controlability. By turning a knob the power is increased or decreased with the speed of electrons—especially adaptable to automatic control devices.
3. Rapidity. Heat is generated within the material —no "soaking" time is required.
4. Flexibility. Heat generating apparatus can be brought right beside the work in many cases, fitted into changing production schedules. Heating is readily confined to the area desired.
5. Repetition. Heat after heat can be repeated automatically without interruption or returned to with absolute accuracy.
6. Uniformity. All desired parts of the material are heated simultaneously and not by conduction from one area to another. Little time is afforded for radiation losses.
7. Cleanliness. There are no residue, scale, products of combustion nor open flames.
8. Economy of space. There is no fuel to store, no bulky pipes and valves. Power generator is self-contained and may often be portable.
9. Economy of operation. The only power consumed is that required for the operation. When power is not being delivered to work, only the power to light the tube filaments and operate the auxiliaries is drawn from the line.
10. Economy of maintenance. Few moving parts to wear out; long tube life expectancy; no long shutdowns for repairs.
11. Simplicity. Once equipment is adjusted to a process, operation becomes a mere matter of pushing buttons and setting dials to calibration data.
12. Safety. Radiations are harmless, and automatic safeguards are provided to protect operating personnel from lethal electrical forces.

Selection

Despite the accomplishments of high frequency heating, there are some limitations to its use. Kw for kw, power generated by high-frequency heating apparatus is more costly than that generated by most other methods. Hence the preliminary analysis should include answers to the following questions:

1. Can the initial cost and subsequent operating expenses be justified by the advantages to be gained from the use of high-frequency heat?
2. Considering the geometry of the work and the behavior of the electrical quantities involved, is application of high-frequency heating practicable?

As a basis for preliminary estimates of initial cost and operating expenses, the power must be computed for each particular application.

Due regard must also be given to the selection of the frequency to be used. There is no magic frequency equally useful in all cases, and, likewise, there are few cases in which an optimum frequency is a "must" requirement. Each type of application will dictate the frequency to be used. The various types may be catalogued into groups, to which a corresponding band of frequencies may be successfully applied.

Induction Heating

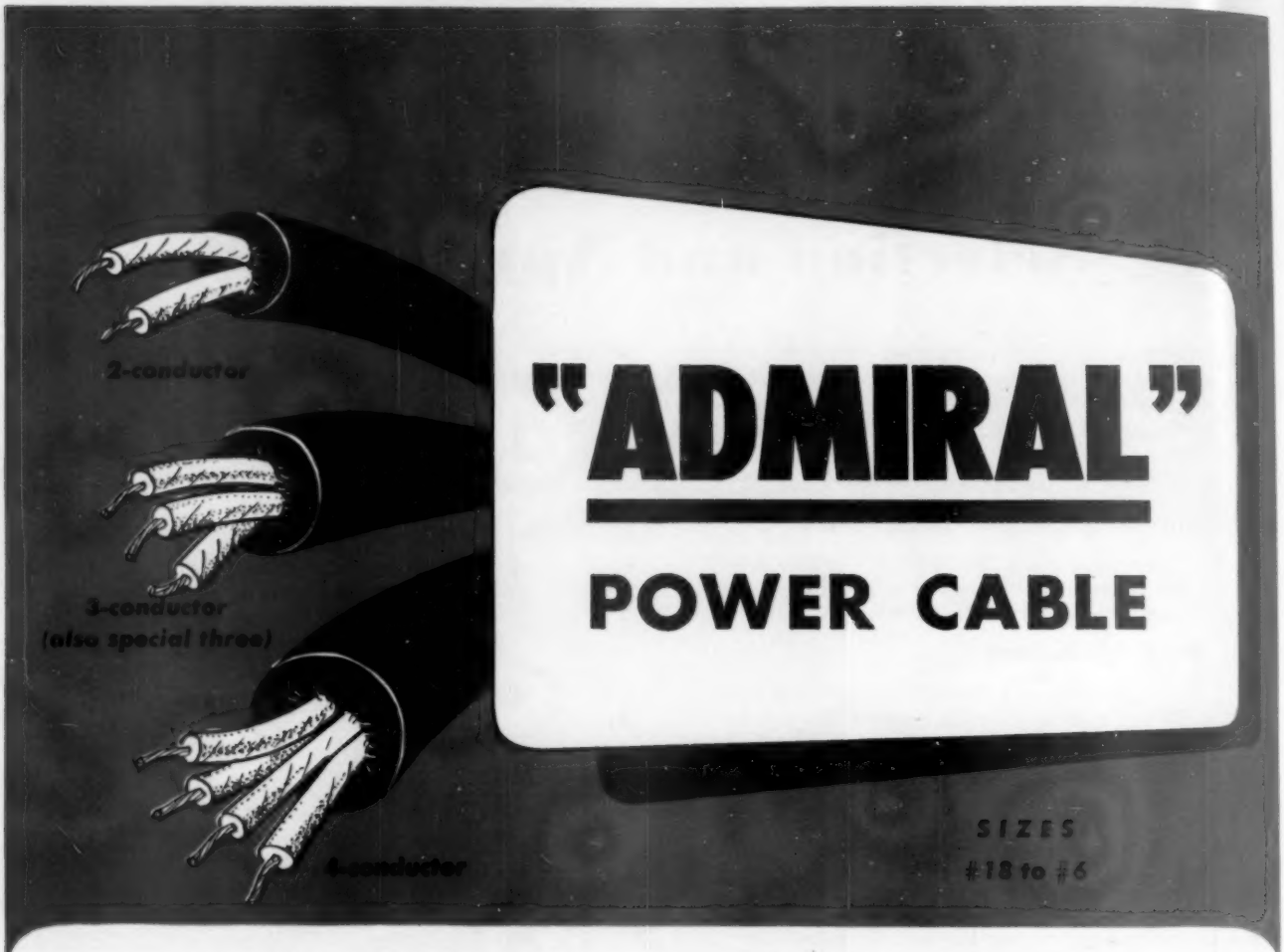
In induction-heating applications, the heat is generated only in the part of the work in which current is present. Because of thermal conductivity, however, the thickness of the heated layer is not solely determined by the depth of current penetration but also by the power input to the heating coil and the heating time.

In case-hardening applications, quenching takes place after sufficient heating time has been allowed to accomplish the desired penetration. For melting and through-heating, it is obvious that either longer heating time or lower frequencies become necessary. Some overlapping of suitable frequencies will be found but so will other limitations occur as the result of the electrical characteristics of the work circuit imposed by the geometry and properties of the workpiece itself.

Dielectric Heating

In dielectric heating, increase in frequency increases the power input to the work. The dimensions of the material to be heated, however, limit the maximum practicable frequency. Since the correspondingly larger electrodes present a greater capacity, the problem of matching the load at higher frequencies becomes increasingly difficult. Also, uneven heating of the work will result when the electrode length approaches an appreciable part of a wave length at the frequency used.

* Data compiled by the Industrial Electronics Div., Westinghouse Electric Corp., Baltimore.



SPECIFIED and PREFERRED

WHEREVER ELECTRIC POWER IS USED

. . . For transmission of primary energy from power line to welding apparatus, motors, tools, fans, etc.

"ADMIRAL" Power Cable is a flexible, type "S" constructed and UNDERWRITER'S APPROVED. Two, three, four, and special three conductor types — each conductor identified by colored, W. P. B. approved, synthetic rubber covering. Jute filler is interwoven between conductors for shaping. Exterior covering is extruded type, continuous vulcanization processed synthetic rubber, which is durable and oil resistant.

PROMPT SHIPMENTS

AT YOUR DEALER **WRITE • WIRE • PHONE**

WELDING ENGINEERING COMPANY
MILWAUKEE, WISCONSIN
MANUFACTURERS — DISTRIBUTORS
OFFICES AND AGENTS ALL OVER THE UNITED STATES

Fabricating Locomotive Parts

(Continued from page 50)

Center Plates, Fuel Tank

After the bolsters are in place, the center plates are accurately located with respect to the platform centerline and the distance between the two centers and are welded in place at the bolsters.

On some platforms, the space between the center sills is used as a fuel tank. This space is thoroughly cleaned and painted, and plates are fitted and welded in place between the center sills to form the ends of the tank. A cover plate over the top of the center sills forms the bottom of the oil tank, the deck plate being the tank top when the platform is in its normal position.

The final step is to turn the platform over in order to finish the small amount of welding that was not accessible when the platform was laying on the floor plate.

Locomotive Truck

The welded truck used on industrial locomotives is as simple in construction. It is very sturdy and can be built so that all parts which require machined surfaces can be machined prior to welding and subsequent machining operations will not be required.

A truck with motors and brake mechanism is shown in Fig. 3. All of the parts are flame-cut from a template with an automatic cutting machine.

Careful design permits nearly complete utilization to be made of the plates, as can be seen from the small amount of scrap shown in Fig. 4, which represents the total residuum after flame-cutting the parts for four truck frames. (This particular design has the end plates on the trucks.)

The truck parts consist essentially of two side frames and a cross tie. The side frames have openings for the journal-box guides and spring suspension. They are connected by the cross tie, fabricated from plate into a box or I-beam section.

Assembly and Positioning

The truck is first assembled in a fixture (Fig. 5), which locates the two side plates parallel and aligns the openings cut for the journal-box guides. The center cross member, consisting of an I-section formed from a center rib and a top and bottom plate, is then assembled. The top plate of the cross member is made so as to form a gusset between the center rib and the side plates.

While the truck is in this fixture, a single-pass horizontal fillet weld is made between the center rib and the top and bottom plates of the cross member, and a single-pass weld is made between the parts of the center section and the side plates. These welds hold the parts securely in place. The spring supports, motor supports, brake hanger brackets and center plates are also assembled in place in this fixture.

The assembled truck frame is now removed from the fixture and placed on a positioning table (Fig. 6) so that the welds may be completed in a downhand position. The welds on the truck are ½ in. and ¾ in. fillet welds, which are made in two and three passes, respectively, with $\frac{5}{16}$ in. and ⅜ in. AWS Class E-6020 electrodes. A-c welding current is used.

After the welding on the positioner has been completed, the journal-box guides are assembled to the side plates. These parts are accurately located with respect to the center plate, trammed with a pin gauge and welded in place.

Tested in Collision

The General Electric Company has been building locomotives with welded trucks and platforms for more than ten years. More than 1,000 are in service today, and the results have been very satisfactory.

A recent collision between an 80 ton Diesel-electric and a steam locomotive provided conclusive evidence of the enormous strength of welded construction. One end plate broke and tore out (Fig. 7), but none of the welds failed. The only damage to the trucks was broken brake cylinders.

Fig. 8 is another view of the platform, taken at one of the bolsters. The impact broke out the bolster plate but did not injure the welds.

AWS E-6010 and E-6020 electrodes are used for fabricating trucks and platforms. The welds are the best manual welds obtainable with present-day welding practice. The size of the weld is gauged to assure adequate throat, and the welding electrode is periodically checked to assure quality welds. The welding operators are qualified to do welds in the positions required, and an inspector keeps a check on the work of each operator.

The use of welding has developed a method of fabricating locomotive parts which are strong without excess weight, that stand up in service and which can be built from such readily available material as rolled steel plate and structural shapes.

the
AGILE

STREAMLINE OF WELDING ELECTRODES

THIS CONCENTRATED LIST WILL COVER EVERY STANDARD WELDING REQUIREMENT

AGILE BLUE for general purpose, all-position AC welding of mild steel.

AGILE RED-WHITE for DC or AC all-position and poor fit-up welding.

AGILE BLUE-RED for AC or DC all-position and poor fit-up welding.

AGILE ORANGE for DC all-position welding of Carbon-molybdenum and other high-tensile steels.

AGILE RED for AC or DC hard-surfacing.

AGILE PINK for AC or DC hard-surfacing.

AGILE DARK-GREEN for AC or DC hard-surfacing of worn steel surfaces and parts.

AGILE BLACK for AC or DC welding of cast iron.

AGILE YELLOW a non-ferrous (copper nickel alloy) electrode for welding cast iron without preheat. AC or DC. Weld deposit is machineable.

AGILE BRONZE for DC welding of copper, brass, bronze, other copper alloys and cast iron.

ORDER FROM A SINGLE SOURCE!

AGILE ACTARC

AMERICAN AGILE CORPORATION

5806 HOUGH AVENUE
CLEVELAND 3, OHIO

Federal RESISTANCE
SPEEDS Parts Production

IT'S an essential industry, teaching babies to walk, helping mothers to transport them; and when The Shuler Company of Cleveland, makers of the popular Shuler Baby-Walker, were given an OK to try to meet the tremendously growing demand, one problem was to increase production of the sturdy Shuler steel wheels...four to every walker.

A slight change in design, a standard Federal P1, 75 KVA Press Type Welder and a simple set of dies met the challenge... **more than doubled production** of the item.

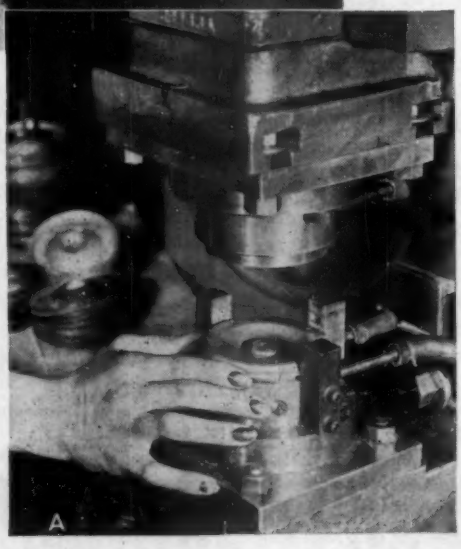
The wheels are made from identical stampings of mild steel. They had previously been spot welded, at a fairly good production rate. Straight thinking design and production heads at The Shuler Company combined their ideas with advice from a Federal applications engineer. Four small projections were added to the stampings, copper ring dies, made

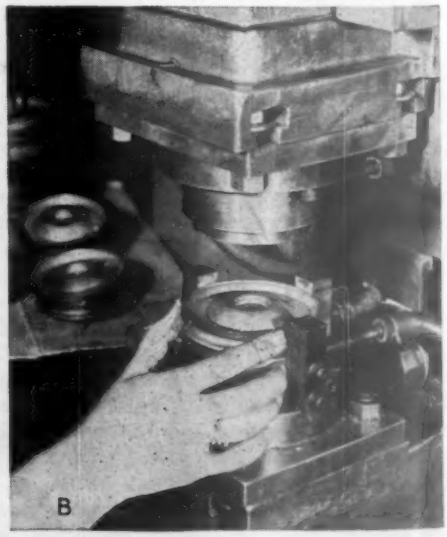
ABOVE . . . The Federal P1, 75 KVA Press Type Welder as installed at the Shuler Plant. At right, operating sequence . . .

A . . . Helper places first stamping in die, projections up.

B . . . Operator places second stamping, projections down. Projections contact face of opposite stamping.

C . . . A touch of the operator's foot on convenient switch completes the sequence, and another wheel blank. Less than three seconds from stock pile to tote box. Single operator can continue at approximately same speed while helper is moving up stock.





THE FEDERAL MACHINE AND

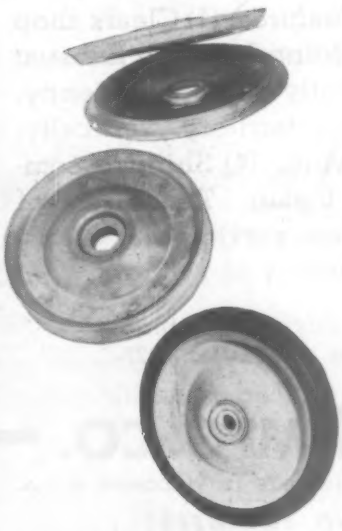
WELDING 100%

from alloy castings, installed on the standard Federal press welder, and the problem was solved. The new method, producing 1,000 wheel blanks per hour, is shown below in pictures that tell their own story.

Not a revolutionary idea, by any means, **but it doubled production on the needed item,** and that is typical of resistance welding possibilities throughout the metal working industry. A Federal Press Type Welder such as the one illustrated, or related models in suitable capacities, might have similar application to, let us say . . .

Instrument Assemblies . . . Gauge Cases . . . Electrical Fixture Parts . . . Lock Assemblies . . . Automotic Valve Components . . . Automatic Switch Parts . . . Radio Chassis Components . . . a wide variety of Hardware . . . Ventilator Grilles . . . Speedometer Casings . . . Ash Trays and other Novelties . . . Two Piece Ventilated Container Caps . . . Radio Tube Assemblies . . . Oil Cleaner Assemblies or what have YOU that might be profitably converted to resistance welding if the facts were known . . .

Federal Press Type Resistance Welders (you can spot weld on them, too) are described fully in Federal Bulletin 4520. Write for your copy today. Remember, in resistance welding, the name of authority is FEDERAL.



WELDER CO. 222 Dana Street WARREN, OHIO

VERSATILE MODERN PRODUCTION TOOLS

WELDERS WITHOUT PRIORITIES

Announcement is made by Sales Manager John E. Ponkow, of The Federal Machine and Welder Company, that his company is now in a position to accept unrated orders for resistance welders. While priorities still are all that the name implies, and important war production still is the first obligation, bookings are now being made and delivery dates assigned to a large number of orders outside of the critical category, Mr. Ponkow said. Delivery schedules while far from normal, are improving steadily.

"TAKE THE WELDER TO THE JOB"

In a large sheet metal shop two men were assembling an angle iron framework which was to be the skeleton for a stainless steel kitchen sink and cabinet installation for a large hotel.

"Why don't you spot weld some of that work?" asked a man standing with the shop foreman.

"How the . . . can you horse a bunch of awkward stuff like this through a spot welder?" one of the workers retorted. "And besides, all of our work is special, we don't have enough of any one assembly for that sort of work."

"You don't have to take the job to the welder, I'll show you how to take a spot welder to the job," the visitor said, and proceeded to demonstrate the application of portable, gun-type spot welders to the job. He also proved that they did not need to have long production runs to make this type of automatic resistance welder profitable. The caller was a Federal Welding Application Engineer, and those men now are using a Federal monorail suspended portable welder with a variety of special "guns" that speed up all kinds of sheet metal fabrication in which the shop specializes.

AUTOMATIC STUD WELDER

Welding certain types of lugs and studs to small machine mounts on a production basis sometimes turns out to be a bit of a trick. One solution which has proved a time and money saver is automatic resistance welding. A Federal press-type projection welder with a special fixture and automatic feed was set up for one motor company to produce mounts complete with studs or threaded lugs (set-up interchangeable to meet production schedules) at the rate of 600 per hour.

SPOT AND/OR PROJECTION WELDERS

The difference between spot welding and projection welding, and information on how one Federal resistance welder can be used interchangeably for either method is included in a new bulletin on press-type welders just released by The Federal Machine and Welder. This is one of the most versatile of all types of resistance welders. Title is "Federal Bulletin 4520."

RUEMELIN Fume Collector

PAT'D.

REMOVES WELDING FUMES
At the Source!

No longer need your employees inhale welding fumes. A Ruemelin Fume Collector solves the problem, quickly and efficiently. It produces a powerful suction that draws out noxious gases, smoke and heat *at the source*. Guards employee health, resulting in less welder fatigue, therefore greater plant output. Has many exclusive features: (1) Clears shop air with minimum loss of building heat. (2) Exhaust snout can be positioned instantly and conveniently. (3) Covers maximum welding territory, vertically, horizontally and by circle swing. (4) Shipped completely assembled, easy to install. Thousands of Ruemelin Fume Collectors now serving war industries. 9 ft. and 15 ft. sizes (radius of swing).

We gladly offer engineering service for your fume collector installation. Write for Bulletin 37-C.

RUEMELIN MFG. CO.

3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS

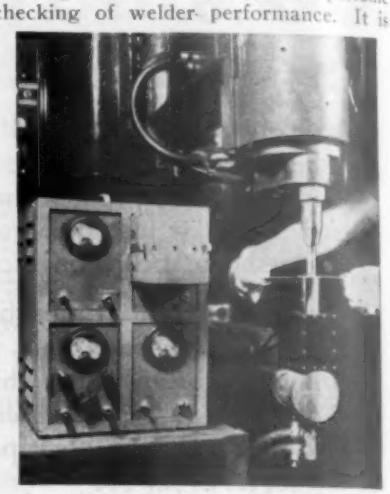
A 4709-⅝-R

New Products

(Continued from page 70)

Current-Force Recorder

★ A current-force recorder for recording current and force in resistance-welding electrodes has been developed for use in welding research and for the periodic checking of welder performance. It is



Close-up of the new G-E current-force recorder in operation.

said to be specially helpful to users of stored-energy welders for determining when forge pressure is to be applied to the work with respect to the discharge of welding current. It also permits resistance welder users to comply with Navy Specification, Navaer PW-6A, Bureau of Aeronautics, Specifications for the Spot Welding of Aluminum Alloy, for Class A Spot Welding.

The recorder consists of an amplifier-oscillograph unit and a special electrode holder. A built-in shunt diverts a proportional amount of current to operate an oscillograph galvanometer. Operating from a 115 volt, single-phase, 60 cycle power source, the amplifier-oscillograph unit simultaneously records a timing wave, the rapidly changing electrode force and the electrode current of the welder while a weld is being made. The 3½ in. paper record also indicates squeeze time, the duration and magnitude of the welding current, the rate of rise of forge pressure and the hold time. Special Products Div., **General Electric Co.**, Schenectady 5.

Heat-Resistant Hard-Facing

★ "Mir-O-Col No. 5" is a new hard-facing rod developed especially for resistance to high heat. Typical uses are for hard-facing hot cutting dies, expeller screws, hot trimming dies, etc. The melting point is approximately the same as that of the average steel on which this type of hard-facing is to be applied.

The alloy has a high carbide content, consisting of a double carbide of chromium and molybdenum. The Rockwell C hardness is 48-52, and the alloy is rigid almost to the melting point so that it will not mush under impact at elevated temperatures. **Mir-O-Col Alloy Co.**, 2416-60 East 53rd St., Los Angeles 11.

The International Nickel Company announces the development of an Inconel Welding Electrode suitable for use with both AC and DC equipment in welding of wrought and cast Inconel and the clad side of Inconel-clad steel.

This new electrode offers the following advantages:

Good arcing characteristics

Good slag removal

Crack-free welds can be made in any thickness

For DC welding, either straight or reversed polarity can be used

This new "132" Inconel Welding Electrode is the latest addition to the line of INCO electrodes, wires and fluxes available for the oxy-acetylene and metal arc welding of Monel, Nickel and Inconel.

Welding instruction bulletin will be mailed upon request. The International Nickel Company, Inc., 67 Wall St., New York 5, N.Y.

NICKEL INCO TRADE MARK **ALLOYS**

MONEL* • "K" MONEL* • "S" MONEL* • "R" MONEL* • "KR" MONEL* • INCONEL* • "Z" NICKEL* • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings . . . Welding Rods (Gas and Electric)

*Reg. U. S. Pat. Off.

HEAT TREATING

"The LINK That Joins Your Welding to Good Results"

60 Kva. BH Type Induction Heater with automatic heat recording and controlling equipment

Preheating may be the one missing link in your chain of welding operation that causes you to miss out. Don't neglect this important link to good results.

Your welding job is no better than the heat treatment it receives, both before and after welding.

If you select Low Frequency Induction pre- and post-heating equipment, you assure dependable results and absolute control in this important link.

The Smith-Dolan System provides maximum convenience and efficiency in Induction Heating. It is now meeting successfully the long felt need for a combination shop and field heating unit to bring dependability to the welding of alloy and high carbon steels.

Whether the welding job involves:

High pressure steam lines . . .
or
The propeller shaft of a fighting ship . . .
or
Pre- and post-heating of boiler drums and plates when automatic arc welding is used . . .
. . . or any other important job . . .

THE RESULTS JUSTIFY THE SELECTION OF THIS METHOD

Wherever controlled deep heating penetration is necessary, the Smith-Dolan System is the choice.

Our experience is at your service. Let us show you how pre-heating and normalizing can do a better welding job for you.

ELECTRIC ARC INC.

152-162 Jelliff Ave. Newark 8, New Jersey

Also manufacturers of

Arc Welders—Gasoline and Diesel Driven—Power Units—A. C. Welders

Three-Purpose Electrode

★ Airco welding electrode No. 315 is designed for any job that calls for an E-6020 or E-6030 electrode for (1) horizontal fillet welds with flat or slightly concave profiles, (2) concave fillets in the flat position or (3) deep fillets. It produces a "spray-type" arc and a thick, porous slag which completely covers the weld deposit under practically every condition. This electrode may be used with either an a-c welder or a d-c welder, straight or reverse polarity. It may be applied with conventional technique, employing normal currents, to obtain a medium penetration or with the high currents recommended for deep-fillet technique to obtain deep penetration.

Applications for the 315 electrode include: pressure vessels and their connections; heavy machine weldments; structural assemblies such as trusses, built-up girders and connections; practically all heavy steel assemblies where high weld quality is important. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

Hardness-Testing Hammer

★ An instrument that makes it practical to take hardness tests in the shop, yard or wherever the material may be is announced by **Steel City Testing Laboratory,** 8843 Livernois, Detroit 4. This portable hardness-testing hammer, type "P", gives a quick approximation of relative hardness for tempering, etc. Material of a known degree of hardness is first selected as a standard, and then it is only necessary to measure the diameter of the impression made in the material of unknown hardness. Microscope and chart are supplied for this purpose. If the impression is smaller or larger than the standard impression, the specimen is either too hard or too soft, respectively.

Type "P" portable hardness-testing hammer gives a quick check of relative hardness.

The hammer consists of a cylindrical housing and a piston carrying a steel ball. A strong spring located between the cover of the housing and the piston presses the latter against the bushing at the open end of the housing.

STACKPOLE
WELDING SUPPLIES

WELDING CARBONS

Stackpole welding carbons are available in a complete line of carbon, carbon-graphite, and graphite types to match individual production requirements. Scientifically formulated for maximum penetration and stability at high current densities, they are supplied in practically any desired shape, taper, or diameter. Write for details.

WELDING PLATES AND PASTE

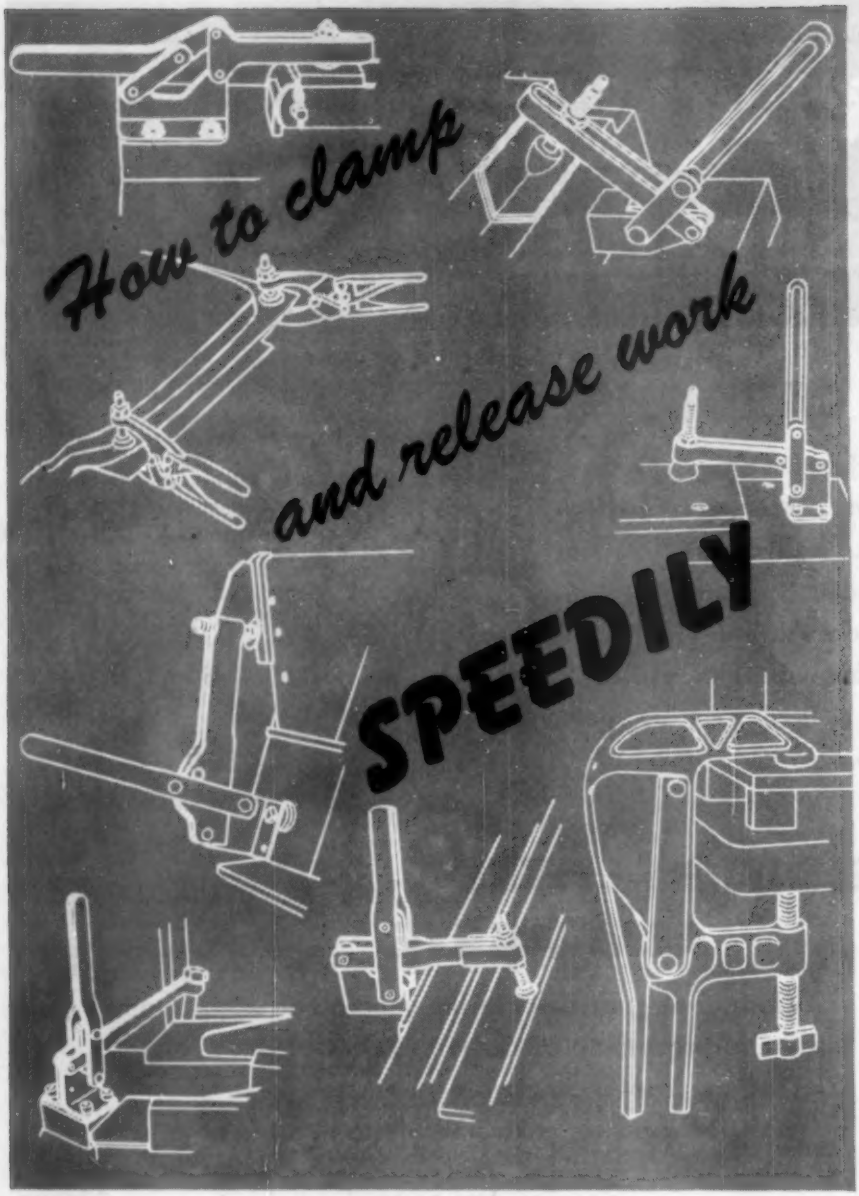
As long-time specialists in the compounding and processing of carbon in practically all of its forms, Stackpole engineers have brought welding paste and plates to a high degree of efficiency. The plates can readily be cut or filed to any shape while the paste can easily be molded. Neither one will liquify when heated, hence will not adhere to molten metal. Stackpole Welding Paste can quickly be torch-dried without danger of blistering, bubbling, or spalling.

STACKPOLE CARBON CO.
St. Marys, Pa.

WHAT DO YOU NEED IN MOLDED CARBON OR METAL PRODUCTS?

BRUSHES
(carbon, graphite, metal, and composition types)
BEARINGS
BRAZING BLOCKS
PACKING, PISTON, and SEAL RINGS

CONTACTS
(carbon, graphite, metal, rare metal, and composition types)
ANODES—ELECTRODES
POWDER METALLURGY
CARBON SPECIALTIES
RHEOSTAT PLATES and DISCS



DON'T waste time in the clamping and releasing of work! Make that time productive by using Knu-Vise clamping devices that can lock work in a second and release it just as quickly.

There's a Knu-Vise Model to meet any need. By drawing on our extensive specialized experience you can gain much valuable help. Send for a complete catalog.

BUY WAR BONDS

KNU-VISE INCORPORATED

2207 EIGHTH ST. DETROIT 16, MICH.
4328 SAN FERNANDO RD. GLENDALE, CALIF.

Electric Marker

★ Small in size, only 6 in. long and 10 oz in weight, the "Ideal" electric marker can be held and used to write with almost as easily as a pencil. It permanently

"Ideal" electric marker. It operates like an electrically-driven hammer.

marks iron, steel, bronze, aluminum, lead and other metals or ceramics, marble, porcelain and even glass. It operates like a small electric hammer and makes 7,200 cutting strokes per minute. A hardened alloy point is furnished for average marking purposes; a diamond point is recommended for extra-hard materials, from 54 to 64 Rockwell C. **Ideal Commutator Dresser Co.**, 1935 Park Ave., Sycamore, Ill.

» «

Die Separator

★ Another new optional feature for the Lyon-Raymond portable hydraulic elevating table is a die separator consisting of a tubular superstructure bolted to the base of the table. The dies are separated by elevating the table top, fastening the top section of the die to the superstructure, then lowering the table top with the bottom section of the die. The attachment is readily demountable when the elevating table is to be used for other purposes. **Lyon-Raymond Corp.**, 2335 Madison St., Greene, N. Y.

» «

Welded Dump Cart

★ This new carrying unit is suited to such purposes as hauling and dumping ashes, scrap, small parts, etc. Of all-welded construction throughout, it has a heavy steel body with a reinforcing flange around the top edge. Tubular handles extend 34 in. from the body. Overall measurements are 79 in. long, 30 in. high, 30 in. wide. **Palmer-Shile Co.**, 7107 W. Jefferson Ave., Detroit 17.

Palmer-Shile new multipurpose welded cart. It can be used for hauling scrap or small parts.

PAGE *Welding* ELECTRODES

DH-936

DH-1023

DH-1174

PAGE OFFERS THIS SERVICE FOR *Better* WELDING . . .

• Good welding is a matter of selecting the right electrodes and using them as they are meant to be used.

This literature is offered as a service. Its purpose is to give welders up-to-the-minute information on the selection of electrodes for specific jobs and how to use them to get best results.

Ask your PAGE distributor for copies of any or all of these informative pieces. Or, if you prefer, write to the factory at Monessen, Pa.

DH-821

• • • • •

DH-1023 If you are welding stainless steel, this 28-page booklet will be of value to you. It is almost a textbook on stainless steel electrodes and their proper use.

DH-936 This booklet is much more than a description of PAGE AF Hi-Tensile Electrodes. It is a comprehensive illustrated manual on their use.

DH-1174 This is a leaflet which describes the physical, chemical and working characteristics of the PAGE High Carbon Shielded Arc Electrode. It also lists a few of its many applications.

DH-821 Probably the most all-around useful booklet of all. It is a pocket-size catalog, arranged so that the recommended electrode or gas welding rod for any one of 28 classes of production welding can be found immediately.

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

This One Respirator does the job of Four

Yes, workers get 4-way safety with this Willson respirator. Protects lungs against 4 different industrial hazards. Metal fumes. Pneumoconiosis-producing dusts. Toxic dusts. Nuisance dusts.

Two double filters provide extra-large filtering area. Give workers the greater comfort of free-and-easy breathing. Filters are throw-away type. May be easily, inexpensively replaced.

Face piece available in two sizes to fit either small or large face. Both sizes carry Bureau of Mines approval. Compact, the respirator may readily be worn under a welding helmet.

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PRODUCTS INCORPORATED

READING, PA., U.S.A. Established 1870

ABOUT PEOPLE

J. F. Joy, formerly director of engineering for The Federal Machine and Welder Co., Warren, O., has been elected vice-president in charge of engineering. Mr. Joy had previously served the Office of Chief of Ordnance, Army Service Forces, where he received a citation from the War Department for meritorious service in "successfully developing an improved type of high-pressure packing which was urgently needed for use with the Field Artillery Material."

» «

Henry A. Mullen, formerly welding supervisor at the Willow Run plant of the Ford Motor Co., has joined the sales department of Ampco Metal, Inc. Milwaukee. He will be attached to the company's Detroit field engineering office as resistance-welding consultant.

» «

Baxter Schroeder has been transferred from the Cincinnati field engineering office of Ampco Metal, Inc., to the home office in Milwaukee.

» «

Harry L. Huntley has been appointed headquarters repair sales manager of the 34 plants of the manufacturing and repair department of the Westinghouse Electric Corp. He will have his headquarters in Pittsburgh. Mr. Huntley has been with Westinghouse since 1926. He was transferred to Pittsburgh in 1940 to organize and manage the repair and renewal parts sales division for the company's central district.

» «

A. F. Petit, recently returned to civilian life from service with the Seabees, has opened the Petit Welding Shop at 386 Whitehall Street, Atlanta. He will specialize in the fabrication and repair by welding of non-ferrous products such as aluminum, Monel, stainless steel, etc.

» «

Harry L. Fordham has been appointed midwest district manager of the Radiant Lamp Corp., Newark. His headquarters will be at the company's new offices at 612 No. Michigan Ave., Chicago 11. Mr. Fordham was with General Electric Supply Co. for nine years as district supervisor of the lamp department.

» «

E. J. Hergenroether, recently resigned chief of the metallurgical branch of the steel division of the War Production Board, has resumed his duties with the development and research division of The International Nickel Co., Inc. He will be in charge of the division's automotive steel development and will make his headquarters at the company's field office in Detroit.

Howard Pennington will be in charge of a new office at 211 State St., Bridgeport, Conn., recently opened by Alfred B. King & Co., Lincoln Electric distributor at New Haven, Conn.

» «

Howard E. Kingdon, formerly works manager of the transformer division of the Eiser Engineering Co., Newark, has been appointed chief engineer and manager of the transformer department.

» «

W. F. Luckenbach, Jr., formerly director of research, has been appointed development engineer of the Foote Mineral Co., Philadelphia. **V. Dale Martin,** formerly in charge of the export division of the sales and research staff of the Wright Aeronautical Corp., has joined Foote Mineral Co. as sales coördinator.

» «

Walter F. Munford, formerly manager of operations of the American Steel & Wire Company's South Works in Worcester, has been named an assistant vice-president. **George A. Gleason,** formerly general superintendent at Worcester, has been made manager of operations to succeed Mr. Munford. **Van H. Leichliter** has been appointed general superintendent of South Works to succeed Mr. Gleason.

» «

Victor V. Nordlund, formerly assistant to the plant industrial engineer in charge of planning, has been appointed assistant plant industrial engineer at the Carnegie-Illinois Steel Corporation's sheet and tin mill at Gary, Ind.

» «

Clyde Williams, director of Battelle Memorial Institute, Columbus, O., was presented the degree of Doctor of Science at recent convocation ceremonies of the Case School of Applied Science, Cleveland.

» «

Milton F. Beecher, director of research for the Norton Co., Worcester, Mass, was awarded an honorary degree of Doctor of Engineering by Iowa State College, Ames, Ia.

» «

David F. Austin, vice-president in charge of sales of Carnegie-Illinois Steel Corp., has been appointed acting vice-president, sales, of United States Steel Corp.

» «

William L. Davis, for the past three years manager of operations of the United States Steel Supply Co., Chicago, has been elected vice-president in charge of operations. Mr. Davis has been associated with U. S. Steel subsidiaries for the last 40 years

» «

Andrew H. Heywood, formerly assistant manager, has been appointed manager of the motor application department of the Westinghouse Electric Corp., East Pittsburgh.

It's "Know-How" that Produces Results for

NORTON RESINOID Wheels

1. **Research "Know-How"**—It took Norton laboratory men thousands of man-hours to perfect the various Resinoid bond formulas in use now —each right for a certain type of grinding.
2. **Manufacturing "Know-How"**—Men who have been making grinding wheels for from a quarter to a half century put their knowledge to use with the best equipment obtainable.
3. **Engineering "Know-How"**—But it's the Norton abrasive engineers who get into the shops and make the final selection—a selection that may make the difference between success and failure of a grinding wheel.

It's this combined "Know-How" that gives Norton wheels for weld grinding their outstanding performance.

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Distributors in all Principal Cities

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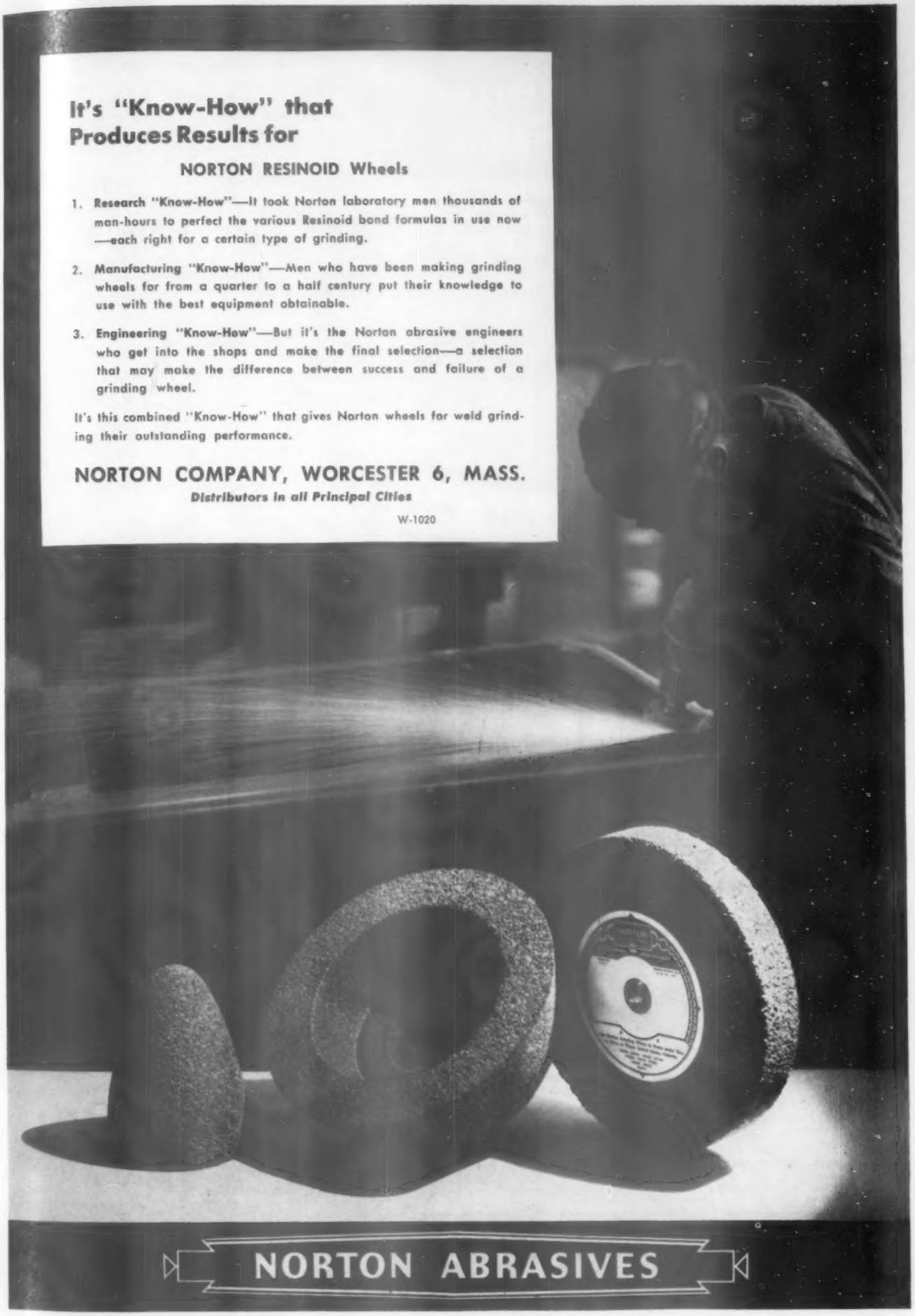

NORTON ABRASIVES

Helpful Literature Just Published

The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.

"Introduction to Electronics"

To provide the layman with an understanding of the fundamentals of electronics, a 20-page, letterhead-size booklet, "Introduction to Electronics," has been brought out by Allis-Chalmers. The material was prepared by Dr. Walther Richter, electrical engineer of the company's engineering development division. The text can be followed by readers without previous knowledge of the subject, while line drawings, curves and sketches aid comprehension wherever the going gets difficult.

The book begins with a brief discussion of the fundamentals of conversion and control of electric power in a load. The electron tube, it is explained, is simply a new control element serving as a special type of rheostat or switch. There are two main kinds of tubes: vacuum and gaseous. Differences between a vacuum tube and the equivalent mechanical device are explained as well as methods of specifying tube performance, application of tube characteristics for design purposes and use of the tube's high-speed response. Clearly presented with applications are the principles of tube detector action and principles of tube oscillators as applied to induction and dielectric heating. Methods of grid control, mercury-pool type tubes, cathode-ray tubes and the electron microscope are also briefly covered.

To secure a copy of this booklet, E6358, address: **Allis-Chalmers Mfg. Co.** 568, Milwaukee 1.

» «

Crayon Samples

A clever single-sheet folder on soapstone crayons for metal marking includes two actual samples of the products, fastened into place by strips of Scotch tape. The two crayons thus shown are "Steelrite," a composition crayon of powdered soapstone, and "Clover," a crayon cut from natural soapstone. **Whittaker, Clark & Daniels, Inc.,** 260 West Broadway, New York City 13.

» «

Electrode Reference Chart

The new Arcos simplified reference chart gives necessary data on high and low alloy welding electrodes, arranged for quick, easy use. Weld-metal chemical analyses are given as well as information on corrosion resistance, heat resistance and weld-metal surfacing. Current and voltage settings and stub end colors are also tabulated for each electrode. A copy of this chart will be sent upon request to **Arcos Corp.,** 1515 Locust St., Philadelphia 2.

» «

Ampco Booklet

A 28-page letterhead-size institutional booklet, Ampco bulletin 71, is devoted to a group of aluminum bronzes that are today in extensive use in aircraft, ordnance, marine equipment, etc. Beautifully printed in black, blue and yellow, this booklet gives typical case histories of products made from the alloy, photomicrographs of nine standard grades and pictures of industrial applications. The uses of aluminum-bronze welding electrodes are also briefly discussed. **Ampco Metal, Inc.,** 1745 S. Thirty-Eighth St., Milwaukee 4.

» «

Hard-Facing Bulletin

Mir-O-Col bulletin MHF-201, "Successful Acetylene and Electric Hard-Facing Technique," is a four-page, letterhead-size folder giving suggested procedures for hard-facing by both the oxy-acetylene and arc processes. The text stresses the essential differences between the techniques of steel welding and hard-facing. **Mir-O-Col Alloy Co.,** 2416-60 East 53rd St., Los Angeles 11.

SWITCH TO BRAZING WITH BRIDGEPORT BRONZE

3,000-lb. Casting Quickly Repaired

This vertical shear for cutting brass rod up to 1⅛" diameter fractured badly, and replacement of the frame would have required many weeks. But that precious time was saved by brazing with Bridgeport's No. 192 low fuming bronze rod. The break was repaired, and the shear put back into production within a matter of hours.

Because brazing requires only local preheating of the base metal to a cherry red, no elaborate set-up for general heating is required, and brittleness caused by high temperatures does not develop. Frequently the brazed section is stronger than the original part. Switch to brazing with Bridgeport bronze for strong, dependable repairs made with a minimum of lost time.

Write for free 16-page booklet full of information about bronze welding alloys, methods and suggestions.

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BRIDGEPORT 2, CONN. • Established 1865

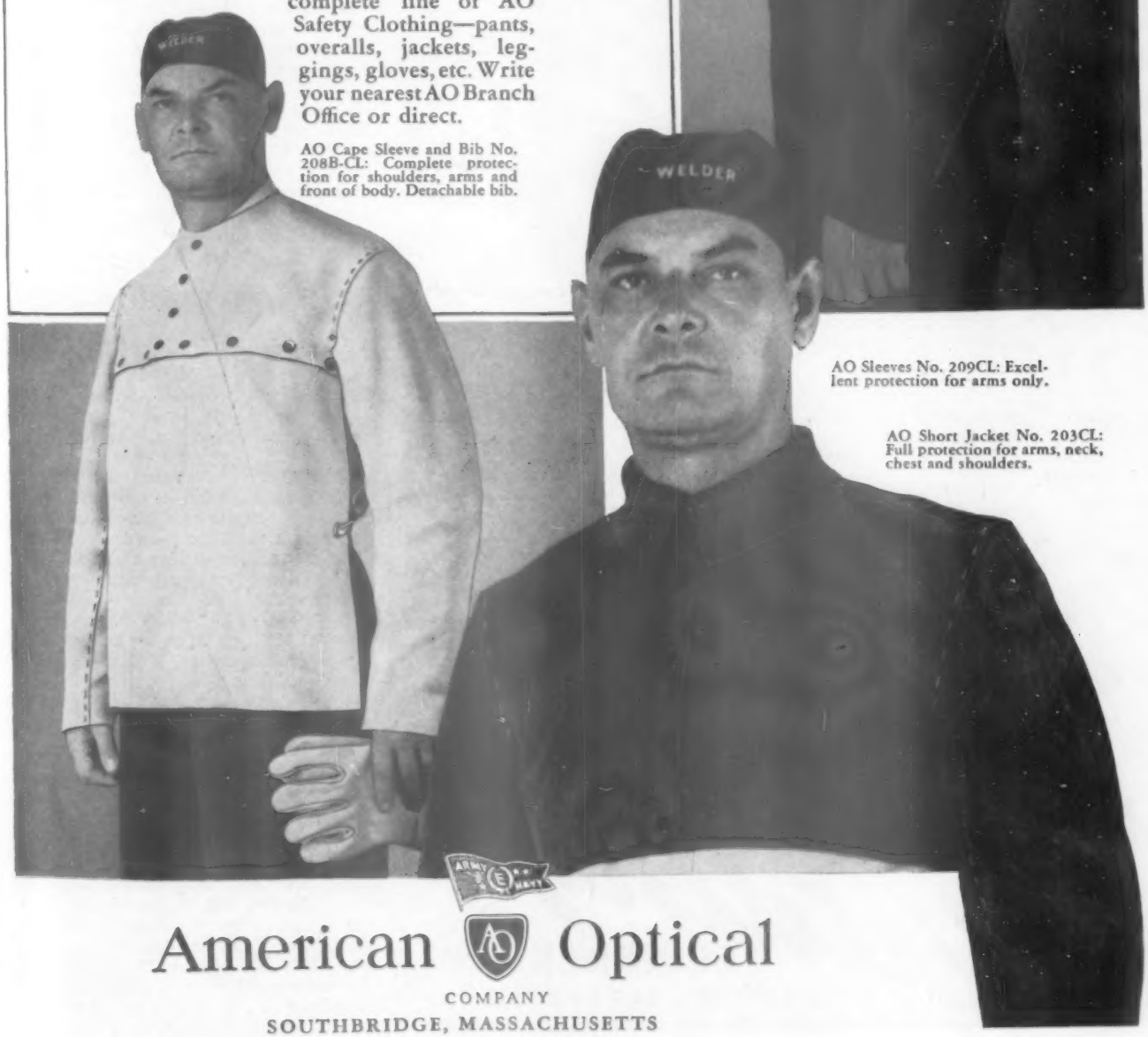
Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS

Welders Work More Comfortably—More Efficiently in

AO SAFETY CLOTHING

These welders are ideally dressed for bench welding, cutting and burning during the hot months. Cut for free action out of high-grade chrome tanned leather, each of the garments provides ample protection for the exposed parts of the body without adding uncomfortable weight for unneeded coverage. Send for catalog showing complete line of AO Safety Clothing—pants, overalls, jackets, leggings, gloves, etc. Write your nearest AO Branch Office or direct.

AO Cape Sleeve and Bib No. 208B-CL: Complete protection for shoulders, arms and front of body. Detachable bib.



AO Sleeves No. 209CL: Excellent protection for arms only.

AO Short Jacket No. 203CL: Full protection for arms, neck, chest and shoulders.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

Silver-Brazing Data

No. 32 "Low-Temperature Brazing News" is a four-page pictorial bulletin devoted to mass-production silver-brazing operations with induction-heating units. **Handy & Harman,** 82 Fulton St., New York City 7.

» «

Fabrication Bulletin

Ampco bulletin 67, "Welded Assemblies Fabricated at Ampco," is a four-page, letterhead-size folder describing the facilities of this manufacturer for producing assemblies made of bronze sheet, castings or extruded parts welded with aluminum-bronze rods. Case histories are given of a number of welded assemblies that were fabricated for use in or near salt water. **Ampco Metal, Inc.,** 1745 S. Thirty-Eighth St., Milwaukee 4.

» «

Temperature-Signaling Bulletins

Three issues of the technical bulletin, "Tempil Topics," cover some of the problems of temperature control and give suggested solutions. These are: No. 1 —Flame-Cutting; No. 2—Aluminum and Its Alloys; No. 3—Fabrication in Safe Temperature Ranges. **Tempil Corp.,** 132 West 22nd St., New York City 11.

Veterans' Rehabilitation

A comprehensive 96-page study, "Industrial Rehabilitation," summarizes the methods and experiences of various organizations in the rehabilitation and re-employment of physically handicapped men, including the war disabled. It includes a foreword by Brig. Gen. Frank T. Hines, administrator of veterans' affairs, a review of the rehabilitation practices in 25 selected industries by John V. Grimaldi, the author of the study, and the highlighting of the best practices by means of a series of articles by representatives of the industries concerned. Mr. Grimaldi also summarizes the prime considerations for an industrial rehabilitation program. A copy may be purchased for 35c from the **Center for Safety Education,** New York University, 8 Fifth Ave., New York City 11.

» «

Aluminum Surface Resistance

A three-page, multigraphed pamphlet gives details of the Kelvin double bridge for measuring the surface resistance of aluminum-alloy sheets to be spot welded —a method developed by Dr. W. F. Hess and his associates at Rensselaer Polytechnic Institute. The pamphlet shows the circuit used, describes the construction and operation of the bridge and lists the materials used in its construction. These pages were prepared to be of assistance to the welding engineer in improving his control over the cleaning and deoxidation of aluminum stock. Clepo Laboratory, **Frederick Gumm Chemical Co., Inc.,** 538 Forest St., Kearny, N. J.

» «

Oxy-Acetylene Flame Uses

A revised edition has been issued of the IAA pamphlet, "Miscellaneous Uses of the Oxy-Acetylene and Air-Acetylene Flames." The principal changes and additions are: a new chapter on controlled low-temperature stress relief, a new chapter on flame-spinning, a new chapter on flame-cleaning and an extensive revision of the chapter on low-temperature brazing. The older material includes chapters on heat treating, flame-hardening, flame-softening, carbon burning, flame-cleaning, paint removal, metals coating, heat treating rail ends, etc. Copies of the new pamphlet, 36 pages, 6 by 9 in., can be obtained at 15c each from the **International Acetylene Association,** 30 East 42nd St., New York City 17.

» «

Low-Temperature Welding Data

The low-temperature welding process and its applications to the postwar era are discussed in a recently issued four-page, letterhead-size folder entitled "Production Ideas" (bulletin EW-20). Photographs and technical diagrams illustrate many jobs that will be done in the postwar period. The 47 Eutectic welding alloys, their fluxes, melting points, shear strengths and purposes are also listed in tabular form. Dept., A-3, **Eutectic Welding Alloys Co.,** 40 Worth St., New York City 13.

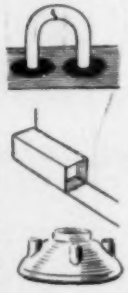
Examples how to do the job RIGHT...

BY USING THE RIGHT ROD!

SALVAGE BROKEN high speed tools, dies and punches with Tool-Rod No. 650—also make new tools, dies and punches from low carbon steels and hard surface cutting edges with Tool-Rod No. 650.

FABRICATE DRILL JIGS and fixtures with Marquette Type 151 Electrode.

REPAIR BROKEN GEARS, gear housings and other cast iron parts with Marquette Nicol-Rod No. 44 or Cast-Rod No. 42.



USE TYPE 151 Electrodes for high speed production welding.

REPAIR ALL STAINLESS STEEL parts with Marquette Stain-Rod Type 308.

USE MARQUETTE RED-ROD Type 130 in 5/64" and 3/32" sizes for light gauge steel welding.

USE MARQUETTE NICOL-ROD No. 44 for machineable cast iron welds.

The Marquette Weld-All Electrode Kit is the "Key to Better Welding." It contains a generous supply of twelve different types of rod. Every rod a leader in its class! Each type is specially designed to meet the exact requirements of its particular kind of welding. Buy the pound or buy the TON. 700 Marquette Distributors are ready to serve you.

MARQUETTE MFG. CO., INC., Minneapolis 14, Minnesota

MARQUETTE
REGISTERED U.S. PAT. OFFICE
Welding
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TRI-FLUX

A NEW AND BETTER SOLDERING FLUX

No. 5 FOR STAINLESS AND MONEL METAL

No. 3 TRI-FLUX (Regular) FOR ALL OTHER METALS

No. 20 TRI-FLUX (Neutral) NO AFTER CORROSION

ONE APPLICATION { CLEANS / REMOVES RUST / FLUXES

Tri-Flux Advantages

- No need to pre-clean with acid, or oil solvent
- Sticks to wet surfaces. Can be applied without first drying surface
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- May be used for hand or torch soldering
- Saves time—one application does three jobs
- Has no injurious effect on surfaces of metals
- Economically applied—put on with brush—no waste
- Will not spoil by standing
- No disagreeable odors

TRI-FLUX is amazing in its simplicity, efficiently performs three distinct jobs and is extremely economical. Saves time and money—no waste. Truly the most etching flux ever developed. **TRI-FLUX** cleans, removes rust and fluxes all in one operation. **TRI-FLUX** made in single strength for steel, iron and other metal surfaces. **TRI-FLUX** No. 5 especially designed for stainless steel and monel metals.

Tri-Flux

"TRIPLE DUTY FLUX"

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Easier - FASTER
PRODUCTION WELDING
WITH
"Standard"
WELDING POSITIONER

- Completely powered, easy, instant control.
- Rotation of table, either direction, 0" to 180" per min.
- Height of table adjustable from 30" to 36".
- Table hydraulically power tilted 135° from horizontal and 150° through full range.
- Capacity for work up to 700 lbs.

WRITE FOR CATALOG

STANDARD MACHINERY CO.
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Learn to Arc Weld Cast Iron with PHILLIPS "600" Electrode

to

Save Time

Avoid Distortion

Get Machinable Welds

ARC welding with PHILLIPS "600" is the preferred method in foundries for salvaging gray iron castings, because deposits from this electrode are (1) of the color of cast iron, and (2) fully machinable, even through the line of fusion. The same qualities recommend PHILLIPS "600" to machine shops, tool rooms and welding repair shops. Our nearest distributor will be glad to show you how easy it is to apply.

Our "4-Ways" manual is a complete guide to the selection of materials and procedures for arc welding cast iron. Send for your copy TODAY.

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MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

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ON

TRINDL SUPER INDUSTRIAL ARC WELDER

DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation.

For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job.

Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money. Write, wire or phone for full details.

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Products & Literature Directory

A 36-page, 6 by 8 in. "Directory of Products and Engineering Literature" has been issued by Allis-Chalmers to list the lines of equipment it furnishes and the technical bulletins it publishes. Major portion of the directory is devoted to a listing of more than 1,600 product types. New products added since the previous directory, such as induction and dielectric heating equipment, are indicated by a star. New engineering bulletins are also starred. **Allis-Chalmers Mfg. Co.**, 565 Milwaukee 1.

» «

Steel Products Manual

Section 9 of the Steel Products Manual, "Cold-Finished Steel Bars and Shafting," has been revised as of May, 1945. This is the fifth edition of this section, originally published in March, 1940. It covers general definitions and manufacturing practices, shafting, special shapes, standard manufacturing tolerances, standard steels—carbon and alloy, non-standard steels—ranges and limits for, permissible variations for check analyses, methods of sampling, etc. **American Iron and Steel Institute**, 350 Fifth Ave., New York City 1.

» «

Publication and Patent Catalog

Battelle Memorial Institute, Columbus 1, O., has just published a 72-page, 5 by 9 in. catalog of the publications and patents which have resulted from 15 years of fundamental and applied research. The catalog lists more than 800 journal contributions, books and patents appearing between the years 1929-1944 inclusive, many of which pertain to welding technology. An eight-page subject index gives a quick cross-reference to all the items included under a desired subject.

» «

Safety Garment Catalog

The Aljay line of "Saf-T" garments for men and women weldors is described and illustrated in a new 16-page, letterhead-size catalog. Products covered include bibs, coats, pants, chaps, overalls, spats, capes, gloves, aprons, sleeves and welding curtains. **The Aljay Mfg. Co., Inc.**, 4 N. Eleventh St., Philadelphia 7.

» «

"Kellerflex" Catalog

"Kellerflex Flexible-Shaft Machines and Accessories," describes and pictures the uses of a flexible-shaft machine for grinding, wire-brushing, polishing, burring, filing, sanding, etc. Among other applications, the "Kellerflex" is used by welding shops for grinding and sanding the high spots left after welding. A wide range of models with varying speeds and different power ratings and a variety of handpieces, attachments and accessories are dispayed in the pages of this 52-page letterhead-size catalog. **Pratt & Whitney**, West Hartford 1, Conn.

For Greater Safety ★ Superior Welding

USE G-E WELDING ACCESSORIES

VENTILATED HELMET

(Cat. No. 87X578) Equipped with a crown sheet for skull protection, this helmet features screened ventilators which provide cool comfort and prevent fogging of the glass. Included also are eye-protective lens, lens gasket, clear cover glass, adjustable chin rest, head gear, snap-on sweatband.

(List Price $6.50)

TREATED COVER GLASS

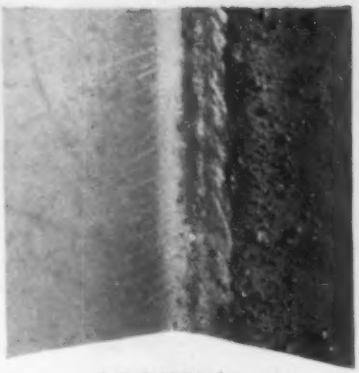
(Cat. No. 98X349) Coated on both sides with a tough, transparent, moistureproof compound this cover glass helps to maintain clear vision and is highly resistant to weld-spatter. Efficiency of coating gives this glass many times the life of an untreated glass.

(List Price $0.10)

FILLET-WELD GAGE

(Cat. No. 92X512) A necessary tool for both operators and inspectors, this handy fillet-weld gage provides a quick, accurate means of gaging fillets which have a straight, concave, or convex contour of the following sizes: $\frac{1}{4}$ in., $\frac{5}{16}$ in., $\frac{3}{8}$ in., $\frac{7}{16}$ in., $\frac{1}{2}$ in. and $\frac{5}{8}$ in.

(List Price $1.25)



G-E GLYPTAL*

No. 1294—Weld-spatter Preventive Coating. A single coating of No. 1294 prevents adhesion of weld-spatter for either singlepass or multipass welds. Especially suitable when fabricating stainless or special alloy steels.

(List Price per gal. $1.80)

*Trade-mark Reg. U.S. Pat. Off.

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BUY WAR BONDS

GENERAL ELECTRIC

672-62-8745

See THIS FIXTURE FOR AUTOMATIC WELDING!

Reloading Is Done During Welding Operation

A BIG TIME SAVER!

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

Automatic Welding-head Positioner — adaptable to your own holding fixture.

WRITE
for information relating to your particular welding fixture problem

ACME Manufacturing Co.
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FROM THE PATENT OFFICE

Brazing Alloy

2,376,577. **Walter A. Dean,** Lakewood, O., assigned to **Aluminum Co. of America,** Pittsburgh. Filed June 19, 1943. Issued May 22, 1945.

A brazing alloy containing from about 56 to 70% silver, 21 to 31% aluminum and from 7 to 16% copper. The silver is in the proportion of from 2 to 3 parts to 1 part of aluminum. The alloy is characterized by having a melting point below 1,000 F.

» «

Brazing Alloy

2,376,578. **Walter A. Dean,** Lakewood, O., assigned to **Aluminum Co. of America,** Pittsburgh. Filed March 10, 1943. Issued May 22, 1945.

A brazing alloy containing from 33.3 to 52.5% silver, 12.5 to 23.3% aluminum and from 30 to 50% zinc. The silver is in the proportion of from 2 to 3 parts to 1 part of aluminum. The alloy is characterized by having a melting point below 1,000 F.

Brazing Alloy

2,376,579. **Walter A. Dean,** Lakewood, O., assigned to **Aluminum Co. of America,** Pittsburgh. Filed March 10, 1943. Issued May 22, 1945.

A brazing alloy consisting essentially of silver, aluminum, copper and cadmium. The cadmium content is not less than 0.1%, and silver and aluminum together form one component of a ternary system. The proportion of silver to aluminum in this component is from 2 to 3 parts of silver to 1 part of aluminum. The alloy is characterized by having a melting point below 1,000 F.

» «

Brazing Alloy

2,376,580. **Walter A. Dean,** Lakewood, O., assigned to **Aluminum Co. of America,** Pittsburgh. Filed March 10, 1943. Issued May 22, 1945.

A brazing alloy consisting essentially of silver, aluminum, cadmium and zinc. The cadmium content is not less than 0.01%, and the silver and aluminum together form one component of a ternary system. The proportion of silver to aluminum in this component is from 2 to 3 parts of silver to 1 part of aluminum. The alloy is characterized by having a melting point below 1,000 F.

» «

Brazing Alloy

2,376,581. **Walter A. Dean,** Lakewood, O., assigned to **Aluminum Co. of America,** Pittsburgh. Filed March 10, 1943. Issued May 22, 1945.

A brazing alloy consisting essentially of silver, aluminum, copper and zinc. The copper and zinc contents are not less than 0.1% each, and the silver and aluminum together form one component of a ternary system. The proportion of silver to aluminum in this component is from 2 to 3 parts of silver to 1 part of aluminum. The alloy is characterized by having a melting point below 1,000 F.

» «

Brazing Alloy

2,376,582. **Walter A. Dean,** Lakewood, O., assigned to **Aluminum Co. of America,** Pittsburgh. Filed March 10, 1943. Issued May 22, 1945.

A brazing alloy containing from 15 to 60% silver, 7 to 30% aluminum, 5 to 45% zinc, 5 to 45% cadmium, 0.5 to 10% copper and from 1 to 10% of at least one of the metals of the group consisting of antimony, lead, tin and bismuth. The silver is in the proportion of from 2 to 3 parts to 1 part of aluminum. The alloy has a melting point below 1,000 F.

» «

Vitrified Grinding Wheels

2,377,995. **Loring Coes, Jr.,** Brookfield, Mass., assigned to **Norton Co.,** Worcester, Mass. Filed Sept. 7, 1944. Issued June 12, 1945.

An abrasive wheel in which the abrasive grains are bonded as a porous body by means of vitrified ceramic material. A filler, furfuryl alcohol polymerized with lignin, is incorporated in the pores.

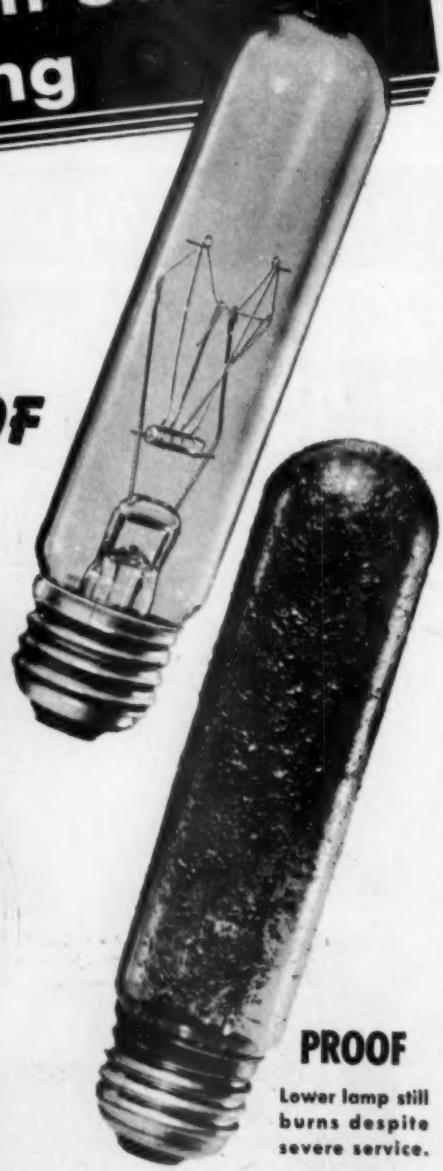
TOUGH LAMPS
For Rough Service
in Welding

Radiant

SPATTERPROOF
LAMPS

Radiant Spatterproof Lamps reduce production delays caused by lamp replacements to a minimum. They are made of special glass to withstand hot metal spatter. A trial order will prove the economy of Radiant Spatterproof Lamps in your own plant. Available sizes, 50, 75, 100, 150 W.

RADIANT LAMP CORPORATION
Lamps from 50 to 10,000 watts
300 Jelliff Avenue Newark 8, N. J.



PROOF
Lower lamp still burns despite severe service.

Announcing

REXALOY OVERLAY ELECTRODES

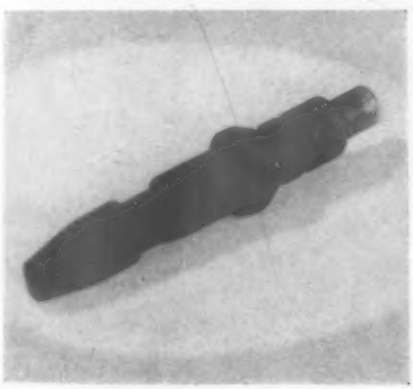
for either **AC** *or* **DC** *machines*

Designed for "toughness" in resisting abrasion—there is a Rexaloy Electrode for every type of overlay requirement.

★

For complete information, see your jobber or write to

THE SIGHT FEED GENERATOR CO., RICHMOND, IND.



Before

— Safe and Easy

TAKE A TIP – USE "TIP CLEEN"

Due to the extreme heat of the torch, impurities and deposits settle in the nozzle and in time clog it up.

Tip Cleen Removes these deposits Easily . . . WITHOUT HARM TO THE TIPS.

Tips already thrown into the discard because their clogged condition made cleaning seem impossible Have Been Cleaned Easily With Tip Cleen.

Just Think Of The Economy . . . Not Only In The Number Of Tips Saved But Also In Labor And Delays!

Save——Time——And——Money

New, Simple, Easy . . . No Harm to Tips

Old methods frequently used Strong and Injurious Acids . . . Tip Cleen Is absolutely Non-injurious to the tips. Drills have been used, but they injure the passages by breaking off and by changing the tapered tolerances.

To clean Tips by this new method, merely heat Tip Cleen to 165 degrees Fahrenheit, drop in tips for ½ hour, remove tips and rinse in cold water. Blow out with air hose. THEY WILL BE AS CLEAN AS NEW . . . No impurities will remain in the air passages . . . it will shine like a new rifle barrel.

Be Convinced At No Cost To Yourself . . . Send For A Free Sample Today.
Weight approximately 50 lbs. per shipping case. Packed in gallon containers 4 to the shipping case.

SHEBOYGAN **WOLFE-KOTE CO.** WISCONSIN

Makers of CORE CLEEN, CARBON CLEEN, GREASE CLEEN

After

Oxy-Acetylene Pressure Welding

2,376,765. **Arthur L. Forbes, Jr.,** El Paso, Tex. Filed May 25, 1942. Issued May 22, 1945.

Oxy-acetylene apparatus for butt welding tubular members under high pressure. Elements are: sectional means for longitudinally aligning the members, shaping the ends and continuously maintaining the opposed ends in abutting relation during the welding operation; sectional means for applying high pressure to the abutting ends while thus aligned; sectional torch means for directing welding flames upon the outer peripheral surfaces of the members at and adjacent the abutting ends; means operative upon contact with the tubular members for causing movement of the respective sections of each of the sectional means from a retracted position laterally of the tubular members into operative position surrounding them.

» «

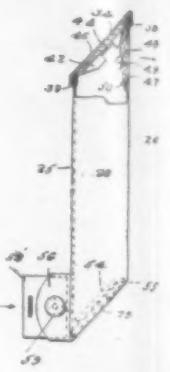
Resistance-Welding Control

2,377,601. **John Wallis Bayles,** Roker, Sunderland, England, assigned to **A. Reyrolle & Co., Ltd.,** Hepburn-on-Tyne, England. Filed Dec. 11, 1942. Issued June 5, 1945.

Apparatus for controlling a resistance-welding machine. A pair of electric contacts are operatively connected to one of the electrodes so that the movement of the electrode in one direction during the initial expansion of the work will cause both contacts to move in unison into engagement. The reverse movement causes them to separate and interrupt the circuit. A means is provided for adjusting the extent of the reverse movement of the electrode from the point of maximum expansion required to produce the separation of the contacts.

» «

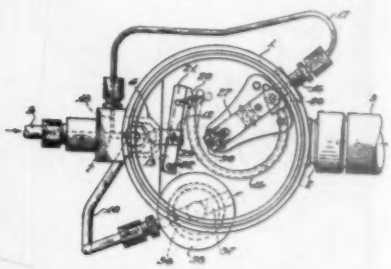
Weldor's Periscope



2,377,671. **Edward E. Burlo,** Green Bay, Wisc. Filed June 28, 1943. Issued June 5, 1945.

A periscope for attachment to a weldor's helmet. It comprises a box-like structure having front and rear walls with offset openings. Reflectors in the structure are arranged to receive images from the opening in the front wall and to project them from the opening in the rear wall. An extension is telescopically fitted in a tunnel-like member projecting from the edges of the opening in the rear wall, forming a sight opening. A means carried by the extension, and extending along opposite sides of the wearer's head, detachably secures the structure to the helmet in such manner that the extension is over both eyes of the wearer.

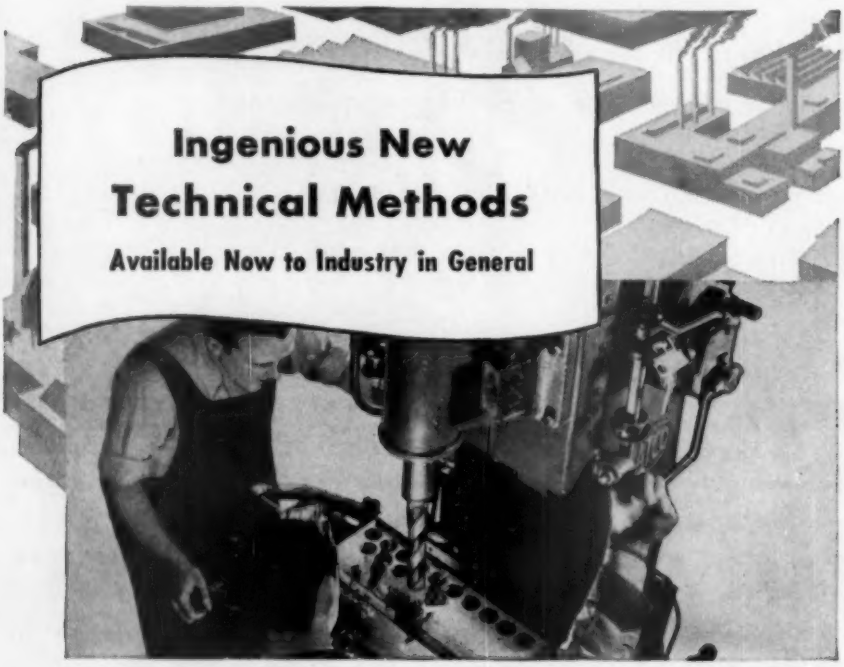
» «



Oxygen Flow Regulator

2,378,047. **John P. Strange,** Wilkinsburg, Pa., assigned to **Mine Safety Appliances Co.,** Pittsburgh. Filed Oct. 6, 1942. Issued June 12, 1945.

A flow regulator through which oxygen is supplied to the wearer of a breathing apparatus. The regulator comprises a main valve adapted to be connected to a source of oxygen under pressure, a Bourdon tube anchored at one end, means operatively connecting the other end of the tube with the valve, a conduit to connect the oxygen with the tube in order to expand it and hence normally maintain the valve closed, a normally closed pilot valve, and a means actuated by the inhalation of the wearer for opening the pilot valve to release the oxygen pressure from the tube. The tube then contracts, and the main valve is opened.



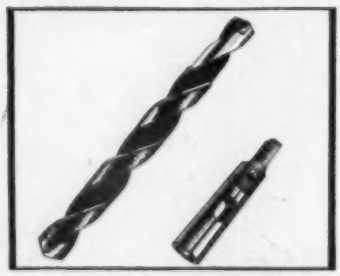
New Shankless Roll-Forged Drill is Faster, Tougher, More Economical

Developed by Ford for wartime uses—available now to industry in general. "More holes at less cost," is the claim for this ingenious new Shankless high speed drill—made in two parts—the drill itself, and a removable taper shank, known as the "drill driver." By this separation, costs to the user have been cut 20% to 30% under conventional taper-shank drills. In the conventional drill, the shank must be discarded when the point and flutes are worn out. Here, however, the drill driver is used throughout the lives of many drills. Shankless drills are roll-forged and twisted, unlike the machined manufacture of ordinary drills, for improved structure.

Principal advantages are (1) Lower first cost. (2) Greater hole production because of greater strength. (3) Reduced breakage with tough "shock-absorber" neck. (4) Greater length of usable flute. (5) Greater scrap recovery value of unused portion of drill.

Wartime advantages of Wrigley's Spearmint Gum show how this quality product, too, can help industry—once it again becomes available. In the meantime, no Wrigley's Spearmint Gum is being made; and none will be made, until conditions permit its manufacture in quality and quantity for everyone. That is why we ask you to "remember the Wrigley's Spearmint wrapper," as the symbol of top quality and flavor—*that will be back!*

You can get complete information from Republic Drill & Tool Co., 322 S. Green St., Chicago 7, Ill.



Shankless Drill and "Drill Driver"

Remember this wrapper

Z-78

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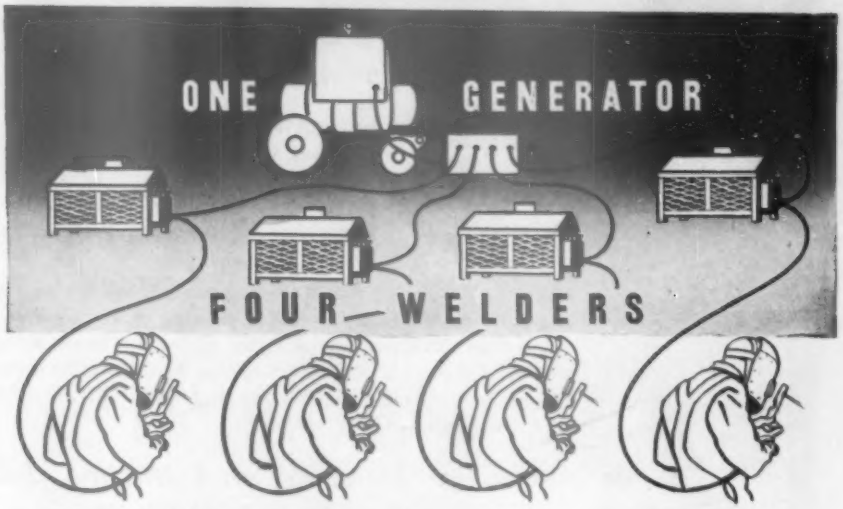
WELDING RESISTOR UNIT



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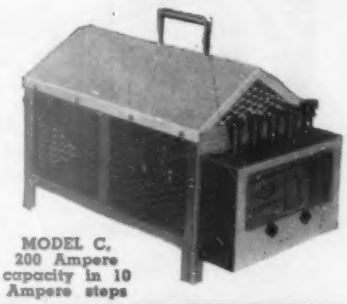
$96.00 LIST PRICE

Discounts on Request

Generators are hard to get . . . expensive. Even with high priorities, deliveries are long delayed and uncertain. The remedy for this situation is to install STEVENS TUFFLINE WELDING RESISTOR UNITS. They multiply your generating capacity by 3 and 4 times at a small fraction of the cost of additional generators.

Thousands of Stevens Welding Resistor Units are working night and day on production lines from coast to coast, including nearly 75% of the nation's shipbuilding concerns. Demonstrations of any Tuffline product given without obligation. Catalogs showing all Tuffline products sent upon request.



MODEL C, 200 Ampere capacity in 10 Ampere steps

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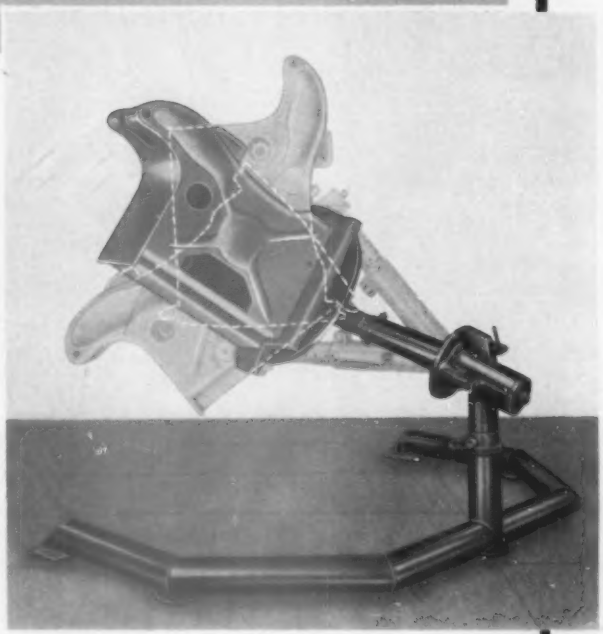
MAXIMUM POSITIONING + FAST HAND OPERATION = MORE PROFIT

ANY WORK up to 500 lbs. in weight can be quickly flipped into position at the touch of a hand through 360° of rotation and 135° of tilt on the Bentley *BALANCED* Positioner. A fast universal tool for repair and production welding, grinding, shot blasting, painting, drilling, overhauling and assembly work.

No power cost. Long structures easily handled, since tilting spindle is *below* face plate. Better welds at lower cost by down hand welding in all positions.

Model No. 5 capacity 500 lbs. with center of gravity 6" to 12" above face plate, which is 30" in diameter. Notice ample foot room allowed by movable base. Pedestal may be set in floor or wall bracket. Model No. 1½, 150 lb. capacity. Bentley *BALANCED* Positioners quickly pay for themselves with better work at lower cost.

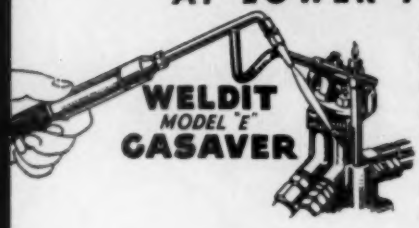
Write for the full story of Balanced Positioning



BENTLEY WELDERY, INC. Box 1038, Dept. C-8, Syracuse, N. Y.

Safe Welding

AT LOWER PRODUCTION COSTS



The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

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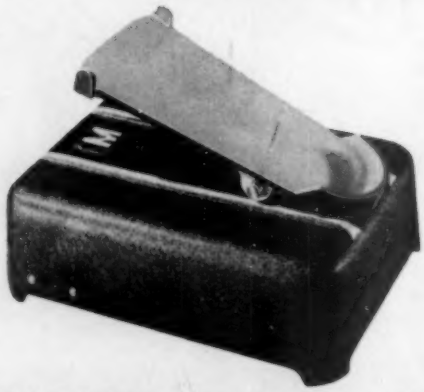
Arctrol

MORE WORK With Less WORK!



INSTANT CONTROL

FOOT CONTROL

FASTER WORK

SAVES TIME

LESS FATIGUE

SAVES LABOR

"Arctrol" regulates the generator output from full-rated current down to snuffing it out completely. It permits the welder to adjust the current for varying thicknesses of metal and for different welding positions . . . merely by moving the foot pedal. Craters are eliminated by "snuffing" out the current as the weld is completed.

Ask your Welding Supply Jobber or write for Data Sheets and Prices.
Specify welding equipment you use.

MULLENBACH ELECTRICAL MFG. CO.
2300 E. 27TH ST. LOS ANGELES 11 CALIFORNIA

Flame-Treating Head

2,378,516. **Paul Edward Timmerman**, Elizabeth, and **Casimir Valentine Johanson**, Cranford, N. J., assigned to **The Linde Air Products Co.** Filed July 2, 1941. Issued June 19, 1945.

A torch head comprising a metal body, a gas manifold and a cast orifice block. To the latter, a plurality of closely spaced gas-conveying tubes are united by a fusion bond throughout their entire external surfaces. The tubes form passages establishing communication between the gas manifold and the atmosphere surrounding the torch head. Each metal tube is non-circular in cross-section and has at least one flat side; the tubes are so arranged that their flat sides lie in a common plane.

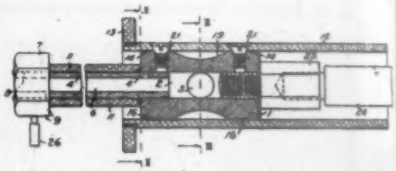
» «

Welded Crankshaft

2,378,686. **Fritz A. Carstens**, Milwaukee, assigned to **A. O. Smith Corp.**, Milwaukee. Filed Aug. 31, 1942. Issued June 19, 1945.

A crankshaft comprising a plurality of cheek and end units jointed together by deposited weld metal. The cheek and end units are formed of low-alloy steel and have enhanced tensile strength provided by heat treatment prior to welding. The weld metal has a tensile strength similar to that of the heat-treated steel.

» «



Electrode Holder

2,378,727. **Herbert O. Quartz**, West Allis, Wisc., assigned to **Allis-Chalmers Mfg. Co.**, Milwaukee. Filed May 14, 1943. Issued June 19, 1945.

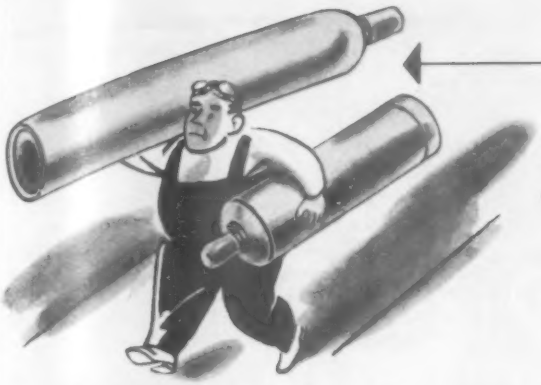
An electrode holder comprising an elongated rigid conductor having a passage extending longitudinally therethrough. An electrically conductive electrode-mounting member is carried by one end of the conductor; this member presents at least one plain exterior surface to which an electrode may be welded. An electrically conductive shank is rigidly secured to the other end of the rigid conductor and has at its other end a means for connecting an electrical conductor thereto. A passage in the shank forms a continuation of the longitudinal passage in communication with the atmosphere.

» «

Soldering Flux

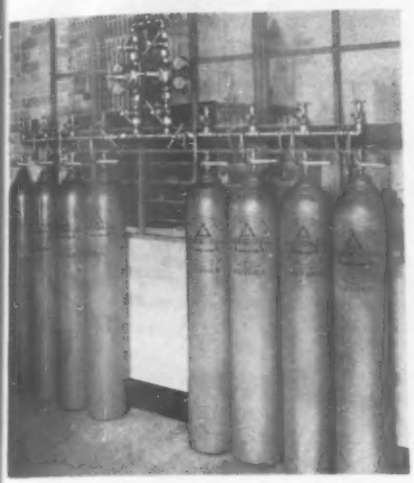
2,379,234. **Oskar Horowitz**, Brooklyn, assigned to **Shanda Laboratories, Inc.**, West New York, N. J. Filed July 8, 1943. Issued June 26, 1945.

A soldering flux consisting of 74.8% zinc chloride, 19.3% ammonium chloride, 0.9% sodium fluoride and 5.0% potassium bromide.



What

DOES IT COST YOU TO HANDLE CYLINDERS?



• Every pair of cylinders that "run-out" in your shop increases your overhead—because the time needed to get full cylinders . . . to switch regulators . . . and to make pressure and flame adjustments is *not* productive.

You can eliminate all excessive cylinder handling costs with a RegO manifold . . . and get other advantages too! Write for full details now.

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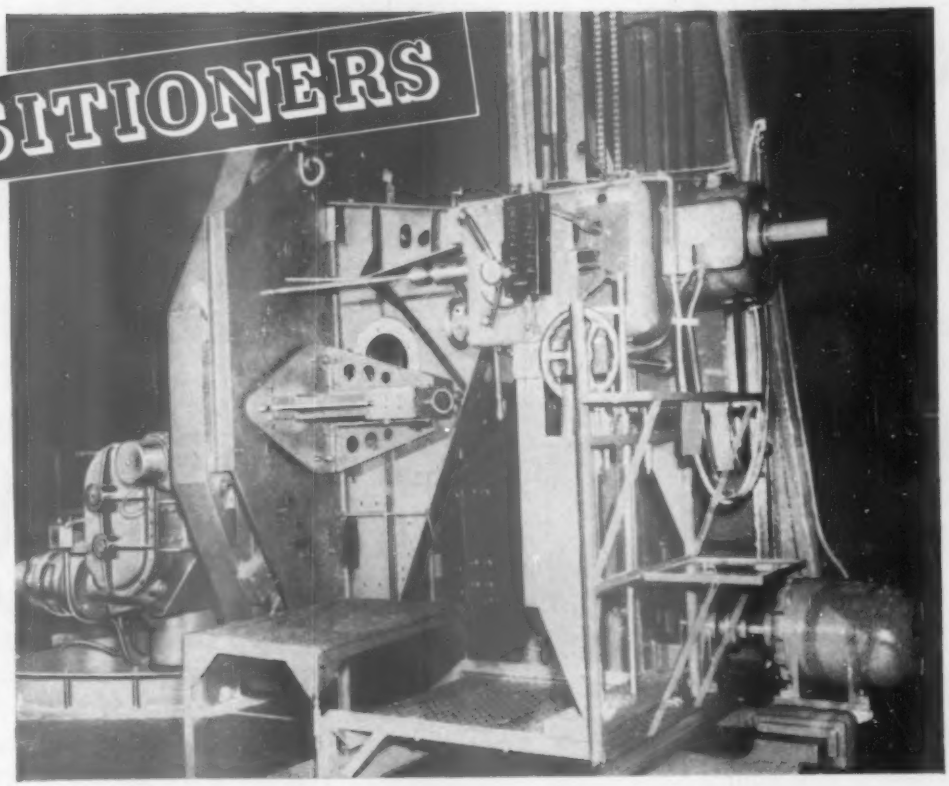
C-F POSITIONERS



Developed for Welding Simplifies Drilling

C-F Positioners were developed to permit "down hand" welding of all sides and angles on weldments, of any shape and practically any weight, with a single set-up. Today, they are not only standard equipment in the welding shop, but have also moved into the machine shop where they are used as universal handling and holding fixtures. Ranging in capacities from 1200 lb. to 30,000 lb., C-F Positioners rotate loads (360°) at any desired r.p.m. and/or tilt them (to 135° beyond horizontal) under push button control. The No. 14 C-F Positioner (illustrated) is being used to support and "position" a cumbersome assembly, permitting the drilling of many holes, which without the positioner would require a series of costly set-ups.

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GARMENT SPLITS

It would make our line easier to sell. Colonial produces large spread whole kips and side splits in Pearl and Fawn. Send for samples.

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FOR WELDERS

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Extra Quality
Series 120 Body Clamps. A large variety of "C" Clamps and Bar Clamps to choose from—
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Ask for them by name—

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TESTED CLAMPS
INDIVIDUALLY TESTED
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- QUICK ACTING
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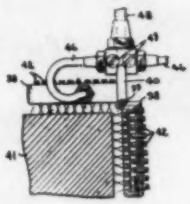
Write for new catalog showing a clamp for every purpose.

Ask your supply house
The Cincinnati Tool Co.
1944 Waverly Ave. Cincinnati 12, O.

Flame-Hardening Head

2,378,001. **Folsom E. Drummond,** Dayton, O., assigned to **The Monarch Machine Tool Co.,** Sidney, O. Filed March 28, 1941. Issued June 12, 1945.

An apparatus for flame-hardening metals. The torch tip has a supporting yoke and a plurality of torch halves with abutting ends filling the space between the open ends of the yoke. A pivot extends through the ends of the yoke and connects the abutting ends of the torch halves so that their face sections may be adjusted to a position in the same plane for flat-surface work or adjusted at an angle to each other for work having angled surfaces. Each torch face has a plurality of orifices which are located adjacent the pivot and yoke ends.



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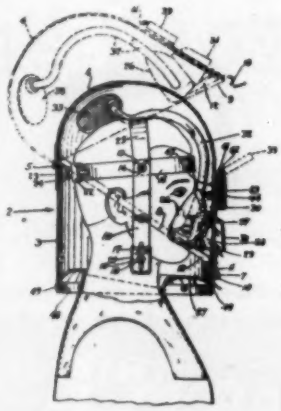


Welding Helmet

2,377,122. **Robert Bakke,** Minneapolis, assigned one half to **Mathias J. Bakke** and one fourth to **Charles J. Swahn,** both of Minneapolis. Filed March 26, 1943. Issued May 29, 1945.

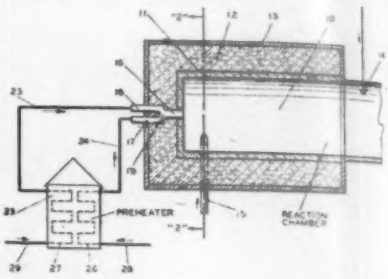
A welding helmet with upper and lower sections joined together in an inclined plane extending upwardly and rearwardly from a point below the operator's mouth. The upper section is hinged to the lower section at the rear of the helmet, and a respirator is carried by the upper section.

» «

Acetylene from Petroleum

2,377,245. **Joseph C. Krejci,** Kaw, Okla., assigned to **Phillips Petroleum Co.** Filed Dec. 3, 1943. Issued May 29, 1945.

A process of producing acetylene by continuously introducing a reactant hydrocarbon in the gaseous state into the inlet portion of a reaction chamber. The latter chamber has a generally circular



transverse cross-section and an interior passage unobstructed from the inlet to the outlet end. The reactant hydrocarbon is flowed continuously through the major portion of the length of the chamber, while an oxygen-containing gas is being introduced into the chamber through a burner port so positioned as to direct the flow of gas in a direction tangent to the inner surface of the side wall and with predominating motion perpendicular to the longitudinal axis of the cylindrical chamber. The resulting mixture of reactant hydrocarbon and oxygen-containing gas is burned to maintain the temperature of the reaction chamber at an acetylene-forming temperature. The oxygen-containing gas is introduced through the burner port at a sufficiently high velocity and in sufficient quantity so as to maintain by centrifugal force the flame and combustion products adjacent substantially the whole inner surface of the chamber, thus forming a separating layer of flame and combustion products between the side wall and the reactant mixture in the reaction chamber. The effluents of the reaction chamber are cooled to below the acetylene-forming temperature, separating the acetylene.

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WELD CONTROL TIMERS
for All Types of Resistance Welding.
Accurate — Fool Proof — Simple — Low Priced.
War Contracts Must be Qualified.
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SCALING & LIGHT CHIPPING HAMMERS

DALLETT presents a complete line of precision-made Scaling and Light Chipping Hammers... All feature DALLETT Safety Retainer Bushing that holds the chisel securely.

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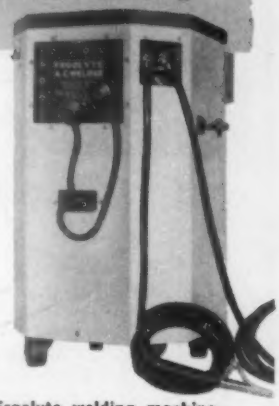
Manufacturers of Pneumatic Tools and Accessories

G. D. Peters & Co. of Canada, Ltd., 1021 New Birks Bldg., Montreal

AN AC ARC WELDER TO FIT YOUR NEEDS



251 or 161 WELDER

+

Whirlwind Air Cooling Assembly

+

Cyclone Automatic Arcing Assembly

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IT'S NEW. Start with a standard Ergolyte welding machine. As your requirements change, you can easily convert within a matter of minutes, a basic Ergolyte 251 or 161 welder to do continuous welding or quick arcing—or both. It's as simple as putting a new battery in your car. These machines have been top performers after 2½ years of testing. You'll find these PLUS FEATURES in combinations to meet your needs. Ergolyte welders are fast and economical to operate. Be equipped to do the BEST welding. PROMPT delivery. Write today.

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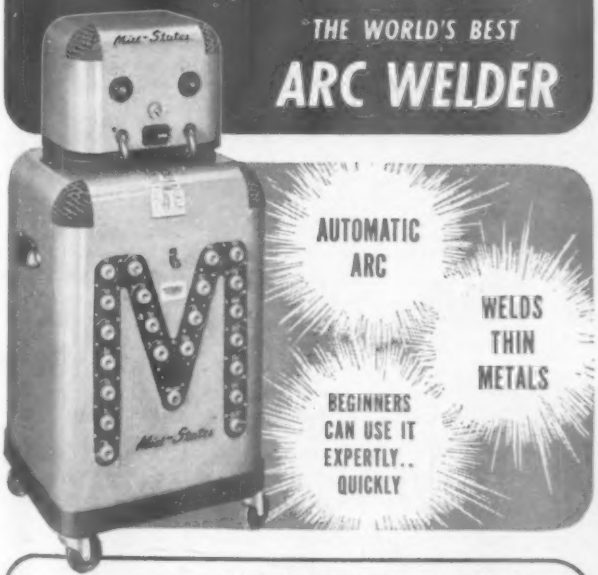

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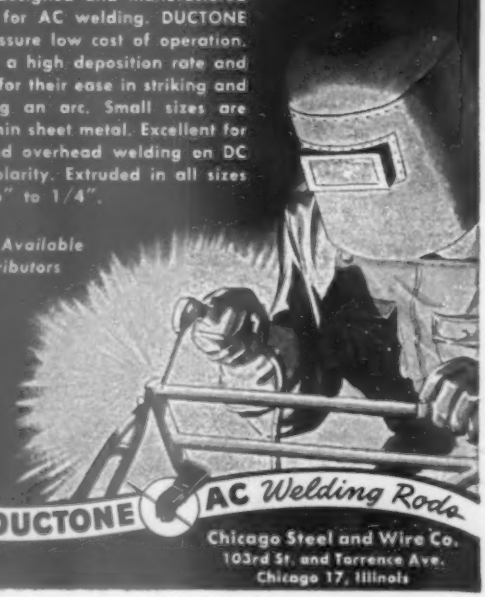
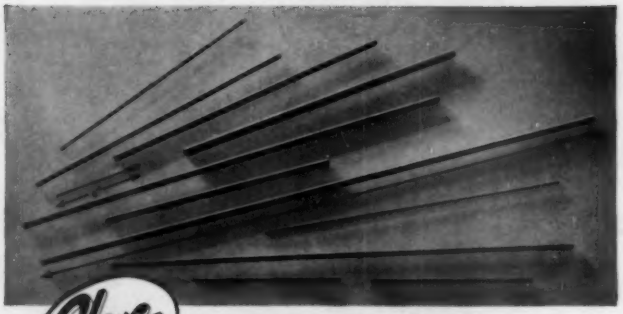
Ductone AC electrodes are available again. This is the famous welding rod that was designed and manufactured especially for AC welding. DUCTONE AC rods assure low cost of operation. They have a high deposition rate and are noted for their ease in striking and maintaining an arc. Small sizes are good for thin sheet metal. Excellent for vertical and overhead welding on DC positive polarity. Extruded in all sizes from 1/16" to 1/4".

Territories Available for Distributors



Reach for DUCTONE AC Welding Rods

Chicago Steel and Wire Co.
103rd St. and Torrence Ave.
Chicago 17, Illinois



Cleve-Tung

POLISHED TUNGSTEN ELECTRODES..

LENGTHS TO YOUR SPECIFICATIONS

Longer lengths mean lower cost per weld. Enjoy this advantage as well as the purity of Cleve-Tung rods, attained by the use of spectroscopic control. Very close tolerances, also. For atomic hydrogen and heliarc welding procedures.

Also CLETALOY ELECTRODES for Spot Welding

Cletaloy Electrodes for spot welding are available in four hardnesses. A copper- or silver-tungsten material developed by us, it insures superior results under conditions where hardness, rigidity and high conductivity are essentials.

CLEVELAND TUNGSTEN, INC.

10200 MEECH AVENUE • CLEVELAND, OHIO

Cleve-Tung

#450

Metro Safety Equipment

METRO'S WELDING HELMETS

We offer a complete line of Welding Helmets.

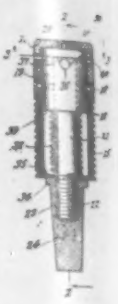
SEND FOR OUR NEW CATALOG.

Distributors Wanted

METRO'S WELDING and CUTTING COVERALLS

METRO MANUFACTURING CO. Long Island City 1, N. Y.

Electrode Holder



2,377,458. **Alfred R. Stalkup,** Coquille, Ore. Filed April 8, 1944. Issued June 5, 1945.

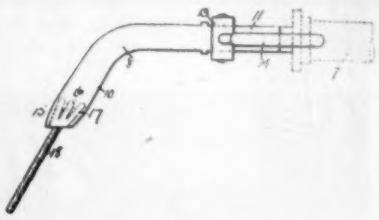
An electrode holder with a tubular insulated handle open at both ends. A tubular metallic collar is secured in the outer portion of the handle; recesses and notches in the collar register with corresponding recesses and notches in the handle. A cable connector is connected to a shank, slidingly and rotatably fitted through the collar; the shank has a transverse aperture to receive the electrode. A spring in the handle is arranged to yieldingly force the collar and connector away from one another. A head on the shank, located outwardly of the transverse aperture, closes against the outer end of the collar. The head has an insulated cap with an inwardly projecting flange which closes against the outer end of the handle.

» «

Electrode Holder

2,377,203. **Michael W. Bannan,** New Britain, Conn. Filed July 7, 1943. Issued May 29, 1945.

An electrode holder with a handle hav-



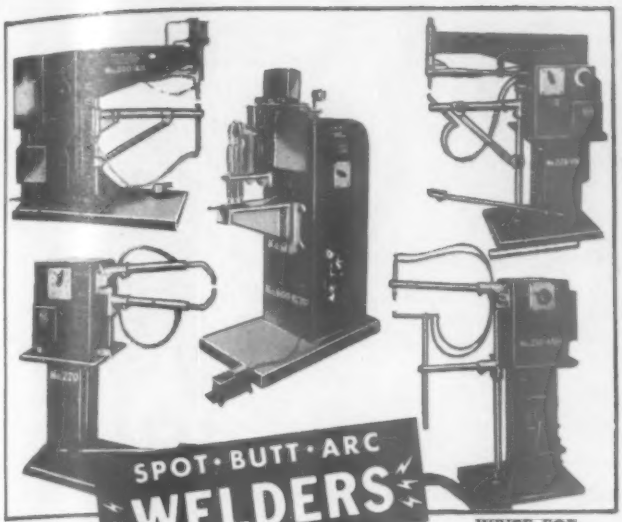
ing a rectangular opening at its inner end. Two flat blades fit closely against each other and closely fit the opening, being workably held by frictional engagement. Registering recesses in the outer ends between the blades extend from a common open mouth inwardly in diverging directions; these are of substantially even length and are closed at their inner separated ends. A means for releasing pressure upon the blades to loosen the electrode is located near the end of the handle.

» «

Metal-Cleaning Process

2,377,876. **Harvey N. Gilbert,** Niagara Falls, N. Y., assigned to **E. I. du Pont de Nemours & Co.,** Wilmington, Del. Filed April 23, 1941. Issued June 12, 1945.

A process for removing oxide from the surface of a metal article composed of a metal substantially non-reactive with alkali metal hydroxides. The article is immersed in a molten composition at a temperature below the melting point of the metal. Composition comprises at least one alkali metal hydroxide having about 1 to 20% by weight of alkali metal hydride dissolved therein.



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WELDERS

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We manufacture a complete line of resistance spot welders from ¼ to 300 KVA for all types of welding. There is an EISLER WELDER for every purpose.

TRANSFORMERS OF ALL TYPES

WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.

CHAS. EISLER
EISLER ENGINEERING CO.
749-SO. 13th ST. — AVON AVE. — NEWARK N. J.

The Right Fluxes Are
The Most Important Part of
Your Metal-Joining Job

Krembs FLUXINE Fluxes are the answer. They are highly concentrated. That is why they are so economical to use and so effective, even though they cost a little bit more. They go four to five times further than any other competitive fluxes. They are all flux . . . no waste material added. They do not bubble, wriggle, blow or chip off the rods when heat is applied. They produce strong, non-porous joints . . . do not cake or deteriorate. They are the result of 70 years of experience.

You can get more and better brazing, silver soldering and welding from Krembs FLUXINE Fluxes. You will be surprised how far they go. Try them just once. You will see the difference immediately.

Ask your Jobber. If he handles our FLUXINE Fluxes, he has your best interests at heart. He knows the FLUXINE line produces the best results with the greatest economy.

Write for chart which shows the FLUXINE Fluxes to use for your metal-joining problems.

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TRADE MARK REGISTERED U. S. PAT. OFF.

WE HAVE
LARGE STOCKS
OF
WELDING
SUPPLIES...
Call us
FOR
QUICK SERVICE!

THE convenient location of our warehouses in the leading production centers enables us to give the best possible service on welding orders under today's difficult conditions. We have large stocks of the following types of Welding Wire for electric arc welding:

STAINLESS STEEL ELECTRODES
MILD CARBON STEEL ELECTRODES

ALSO available for speedy delivery are Welding Machines, Protect-O-Metal for the elimination of weld spatter and Havens "C" Protected Clamps. Phone, write or wire our warehouse nearest you—all orders and inquiries receive courteous attention and prompt action.

UNITED STATES STEEL SUPPLY COMPANY
CHICAGO (90) · BALTIMORE (3) · BOSTON (34)
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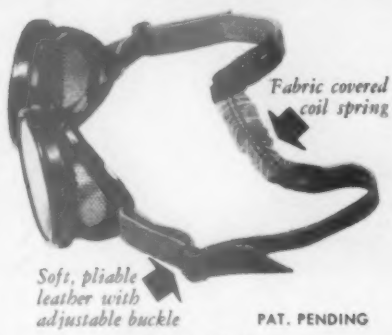
UNITED STATES STEEL

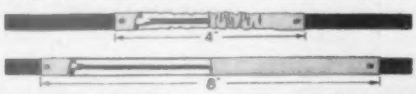
HOLD-TITE Goggle Headband ★ HOLD-TITE Goggle Headband ★ HOLD-TITE Goggle Headband ★ HOLD-TITE Goggle Headband



PAT. PENDING

THIS IS A
HOLD-TITE
Goggle Headband

No Rubber to over-stretch — No Elastic to wear out



Fabric Covered Coil Spring — Stretches from 4 to 8 Inches

★ lasts indefinitely
★ all day comfort
★ fits all goggles
★ quickly adjustable

25¢ EACH — *Immediate Delivery*

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225 WEST ELEVENTH STREET
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COVER LENSES

for Gas Welding.
Spatter-resisting or plain.

GOGGLE LENSES (50 mm)

Protect Your Vision with the Best in Lenses and Plates

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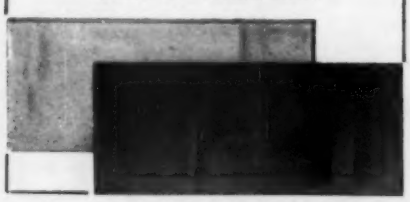
SUPER-PLATE FILTER LENSES for Helmets and Handshields.

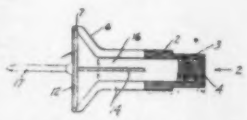


Spot-Welding Tip Holder

2,379,983. **Alexander L. Munson,** Detroit. Filed Nov. 8, 1943. Issued July 10, 1945.

A spot-welding tip holder having passages through which a coolant may be supplied. Holder is associated with a control member, which is movable to forcibly separate the tip from the holder and to control the effectiveness of certain coolant passages.

» «



Stud-Welding Chuck

2,378,720. **Ted Nelson,** San Leandro, Calif. Filed March 17, 1943. Issued June 19, 1945.

A chuck for holding the thin, broad head of a stud to be welded to a plate. One end of the tubular body is provided with a coupling, and the opposite end is formed with a number of axially extending slots so as to provide a plurality of resilient fingers to grip the stud head. Each of the free ends of the fingers has a radially extending rib and a forwardly facing shoulder on its inner surface, the rib comprising adjacent and oppositely inclined walls. The inclined walls and shoulder of each finger coöperate with the respective walls and shoulder of the next adjacent finger, whereby the resiliency of the fingers will cause the innermost inclined wall to constantly urge the stud head against the shoulder so as to maintain the stud firmly within the tubular body.

» «

Respirator Mask

2,376,871. **Rudolph Fink,** Dayton, O. Filed May 24, 1941. Issued May 29, 1945.

A respirator mask of resilient material having such shape as to fit and contact accurately that portion of the wearer's face around the nose, cheeks and chin. The mask protrudes outwardly from the mouth and nostrils, where it is formed with horizontal corrugation extending around the sides as far as the hinge points of the wearer's jaw. This permits the unrestricted use of the wearer's mouth and chin in talking without destroying the fit of the mask.

BRAZE RATHER THAN WELD ALUMINUM

The Kre-Co Aluminum Brazing Process makes brazing possible at a temperature safely below the melting point of the parent metal. Makes a perfect bond even with thin gauge aluminum. Used with a 5% Silicon Rod. Bulletin A 3 contains valuable information you should have.

KRE-CO MULTICHEMIC FLUX
DIVISION OF
CHARLES W. KRIEG CO.
52-60 Dickerson St. Newark 4, N.J.

The NEW, IMPROVED Variable-Core type
GREYHOUND

A. C.
Arc Welders
Provide
LOWER
OPERATING
COSTS
for
HEAVY DUTY
PRODUCTION

Detailed information and prices sent on request

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News of the Industry

G-E Offers Film Course on Industrial Electronics

A new talking slide-film training course on the broad subject of industrial electronics was announced last month by the General Electric Co. The course consists of: 12 talking slide-films (35 mm film strips and 16 in., 33⅓ rpm records), each approximately 30 minutes in length; 25 copies each of 12 lecture review booklets; an instructor's manual and a specially built carrying case.

The introductory film, "Harnessing the Electron," illustrates the wide range of applications of electronic tubes and their four fundamental uses. The second film, "Electronic Tubes as Rectifiers," describes the three chief types of electronic rectifier: kenotron, phanotron and ignitron. In the third film the grid control of electronic tubes is discussed at length, and the fourth and fifth films cover the fundamentals of electricity. Six of the remaining films are devoted to photoelectric and electronic relay systems, electronic rectifier equipment, the "Thymo-trol." drive, electronic heating and electronic control of a-c power. Film number nine, "The Electronic Control of A-C Power," is of particular interest to the readers of this publication since it pertains largely to resistance welding. Welding control circuits such as the sequence timer, the ignitron contactor, synchronous timing and heat control by phase shift are described and applications shown.

The final film, "Electronics—Today and Tomorrow," summarizes present applications and discusses the general trend of industrial electronics and its wide possibilities in the postwar world. Throughout the twelve films, cartoons, animated drawings and simple diagrams are used extensively to supplement the many views of typical electronic applications.

» «

Graham Warren City Plant Will Make Farm Equipment

Graham-Paige Motors Corp. is establishing its farm equipment division at the Warren City Mfg. Co., the company's subsidiary at Warren, O. Vern R. Drum, vice-president and general manager at Warren City, heads the operations of the new agricultural division. W. A. MacDonald, vice-president, is in charge of the sales staff, and Truman F. Schrag is chief engineer.

The company plans the manufacture and sale of the "Rototiller," a new tractor and other agricultural machinery. To test and develop new machinery, an experimental farm will be operated. The Rototiller is a Swiss invention which churns and thoroughly crumbles the soil by means of curved-edge tools rapidly revolving in paddlewheel fashion. It will be produced at Warren in various sizes. Details of the new tractor and other farm machinery will be announced later.

Lincoln Electric Conducts Three New Welding Courses

Three new specialized courses in arc welding are now being held at the Cleveland plant of The Lincoln Electric Co. under the supervision of Arthur Madson, veteran Lincoln instructor. The first course is a two-week training period in the technique of arc welding of the common steel alloys and non-ferrous metals. The second course, of one week's duration, is devoted to instruction in the welding of sheet metal in thicknesses of from 12 to 20 gauge. The third course, two weeks, is intended to train students in the welding of pipe in diameters of from 2 to 10 in.

DOCKSON SPECTACLES

NO. 33-17-2 WELDERS FLASH AND IMPACT PROTECTION

NO. 32-08 FOR POLISHING, GRINDING AND BUFFING

For maximum safety, comfort and durability Dockson Spectacles cannot be beat. Years of manufacturing experience, finest materials and superior craftsmanship make these Spectacles outstandingly better.

There is a Dockson Spectacle style for every requirement in flash or impact protection—a full range of nose bridge styles and sizes. Easily interchangeable lens are available.

Desirable dealer territories open

If they carry the name DOCKSON your spectacles are styled to fit the Job—they are Built for Better Service. Stocked by a Dockson Dealer near you.

DOCKSON CORPORATION
3839 Wabash • Detroit 8, Mich.

SPEED RECONVERSION

WITH COMPOSITE DIE FABRICATION BY WELDING

(Above) Composite-Fabricated Die. The Base is Mild Steel, the Cutting Edges, "Hard-As-Welded" Deposits of Eureka Oil-Hardening Tool Steel Electrodes.

Eureka Tool and Die Welding Electrodes, for composite die fabrication, facilitate planning and effect speedy results in reconversion. Plain carbon or low alloy NE steels are used as a base and weld deposits of the various Eureka Tool and Die Welding Electrodes constitute the cutting edges or working areas. Units so constructed efficiently replace those constructed entirely of tool steel.

ELIMINATION OF HEAT TREATMENT

Deposits of Eureka Electrodes, which are "hard-as-welded" eliminate the need of complete heat-treatment after welding.

COSTLY MAINTENANCE AVOIDED

The ability to produce a composite tool or die results in a working surface of any desired characteristic with a resilient core.

CONVERTING INTO COMPOSITE UNITS

Convert existing tool steel die sections into composite units to meet unusual conditions.

MACHINING IS FINAL OPERATION

In composite fabrication by welding, finish machining, drilling, etc., can be done as final operations.

INSERTS ELIMINATED

Composite fabrication by welding eliminates the use of inserts, which are often too costly, unsatisfactory or impractical.

MULTIPLE APPLICATIONS

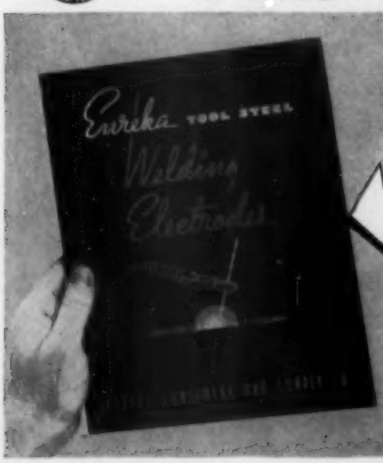
In composite fabrication by welding, it is practical to weld two, three or four types of unlike materials on one die unit to perform individual functions.

EUREKA WELD ELECTRODES AND THE SPOT

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN



WRITE FOR YOUR COPY TODAY

This manual will help you save man-hours, conserve material and minimize production delays by outlining methods of repairing and compositely fabricating tools and dies, as well as correcting design and rectifying errors. Send for your copy today. It is fully illustrated with typical welding applications.

Interchangeable Gas Cylinders Asked for Britain and U. S.

Interchangeable screw threads for the compressed gas cylinders made in Great Britain, Canada and the United States was one of the subjects discussed at a recent conference held in New York City. Under the auspices of the American Standards Association, technical men from the Army, Navy, Air Forces and from the automobile, aircraft, machine tool, electrical and other industries met to work on a series of standards for the threaded parts going into aircraft engines, aircraft fuel lines, aircraft control mechanisms and instruments as well as threaded products for miscellaneous industrial applications. Primary purpose of this series of meetings was to consolidate the American point of view before the expected gathering of British, American and Canadian technical experts, scheduled to be held at Ottawa this fall under the auspices of the Combined Production and Resources Boards.

Interchangeability between the valve outlet threads of gas cylinders of American and British origin is a matter of great importance to the military, it was brought out at the New York City conference. It is at present impossible for American Armed Forces to either use or refill British gas cylinders. A technical committee of the Compressed Gas Manufacturers Association has taken the first step towards rectifying the situation by drafting a proposal to be taken up with the British and Canadians at the Ottawa conference. This covers not only threaded connections but also other details of the cylinder valves for which international standardization is necessary to secure a maximum interchangeability.

» «

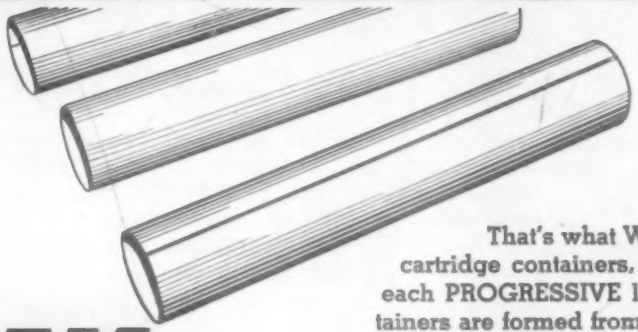
U. S. Steel to Expand Gary and South Chicago

Initial disclosure of some of the United States Steel Corporation's postwar plans for the subsidiary companies operating in the Chicago district was made recently by Irving S. Olds, chairman of the board. Mr. Olds revealed that postwar improvements and expansion in the Gary facilities alone will cost at least fifty million dollars, including work at the plants of the Carnegie-Illinois Steel Corp., American Bridge Co. and National Tube Co. Carnegie-Illinois has announced that as soon as possible it will launch postwar reconstruction work to make three blast furnaces at South Chicago and Gary the largest in the country and to increase the cold reduced tin plate capacity at Gary. The Gary and South Chicago steel works already rank as the world's largest and second largest, respectively.

» «

Milne Distributor for Byers Iron Bars

A. Milne & Co. has been named national distributor for wrought iron bars manufactured by A. M. Byers Co., Pittsburgh. The Milne organization operates warehouses in New York City, Boston, Chicago, Pittsburgh and Philadelphia.



SEAM WELDING at 15 ft. per MINUTE

That's what Western Stove Works is doing on 18 gage M-16 cartridge containers, with an output of 90 containers per hour on each PROGRESSIVE longitudinal 200 KVA seam welder. The containers are formed from flat stock, rolled up and lap welded. Fixtures are air operated, the clamping action accurately gaging the lap before welding.

Other operations performed by Western Stove on these containers include projection welding the base sub-assemblies at 600 per hour on a PROGRESSIVE projection welder; welding cover locking rings to the body, tack welding the bottom to the body and spot welding the chimb rings to the body—all on a battery of PROGRESSIVE 50 KVA spot welders. The 10 gage bottoms are seam welded to the containers on 150 KVA PROGRESSIVE circular seam welders at 120 assemblies per hour per machine.

These are just typical of one plant in which resistance welding is used to turn out materials faster, better and at lower cost. For 100 examples of "RESISTANCE WELDING AT WORK" ask for 60 page book: No. WP-44.

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

Possible Savings on Tractor Repairs Using

"TWO-TONE"
Welding

DRIVING SPROCKETS

Cost $180 Pair. Cost to rebuild with "Two-Tone" $39. Saving $141. Rebuilding time only 22 hours. Rebuilt sprockets will last twice as long as new. Hard-faced.

BOTTOM ROLLERS

Cost new 12 rollers $200 to $240 set. Cost to rebuild $42. Saving $158 to $198. Life of rebuilt rollers twice that of new. Rebuilding time 20 hours. Hard-faced.

FRONT IDLERS

Cost $135 pair. Cost to rebuild $13. Saving $122. Time rebuilding 6 hours. Rebuilt job hard-faced. Life 300% of new.

TRACK RAILS

144 links both rails. Cost $700. To rebuild $65 plus $75 for rebushing, labor and materials. Saving $560. Time 32 hours. Hard-faced. Will last twice as long as new.

"Two-Tone" Welding is for high speed repairing, rebuilding and hard-surfacing on heavy duty equipment such as tractors, shovels, rock crushers, buckets and pumps. Send for Bulletin 7.

RESISTO-LOY COMPANY

GRAND RAPIDS (7) MICHIGAN

1945 AWS Convention to Be One-Day Affair

Because of the ODT measure limiting attendance at assemblies to not more than 50 persons from out of town, this year's convention of the American Welding Society will be a one-day meeting confined to officers, directors, awardees of medals and prizes, newly elected honorary members and the like. It will be held in coöperation with the New York Section of AWS at the Hotel Pennsylvania on Thursday, Oct. 18. This meeting is to be held apart from the American Society for Metals and without an exposition. The Metal Show, usually held in October, has been postponed to an indefinite date.

In lieu of the usual AWS convention, a "convention by mail" will be held in *The Welding Journal*. Papers will be reproduced in coming issues of this magazine in accordance with past practice.

» «

General Electric X-Ray Expands Plant Capacity

In a move planned to increase plant capacity, the main offices of the General Electric X-Ray Corp. will be transferred from the company's plant at 2012 Jackson Blvd., Chicago, to a new location in the Insurance Exchange Bldg., 175 Jackson Blvd., in the Chicago Loop.

» «

WPB Revokes Order on Calcium Carbide

In line with its policy of placing as many allocated chemicals as possible under the control of a single order, the War Production Board has revoked Order M-190 governing calcium carbide and transferred allocation control of the chemical to Schedule 112 of Order M-300, the general chemicals allocation order. No changes in allocation procedure are involved.

» «

Linde Oxygen Cylinders to Be Painted All-Green

The color scheme on Linde oxygen cylinders is being changed from green-and-gray to all-green. The first all-green cylinders made their appearance about the first of July. The color change, the company stresses, serves to emphasize the importance of reading the label on a gas cylinder to determine the contents rather than trying to identify the gas by the cylinder's color.

» «

G-E Scholarship Fund Honors Gerard Swope

A fund of $400,000 to be known as the Gerard Swope Foundation has been set aside by the directors of the General Electric Co. to assist in higher education and fundamental research work in scientific and industrial fields. Mr. Swope served as president of General Electric from May, 1922, until the close of 1939 and returned to head the company for an additional two years in 1942-44 when President C. E. Wilson was acting as executive vice-chairman of the War Production Board.

PRECISION WELDING for PRECISION PRODUCTION!

Gasweld

AV-10 *Aircraft* WELDING TORCHES

Speed Fighting Planes to Fighting Fronts

This light-weight AV-10 Gasweld Torch meets the urgent needs of America's great aircraft industry. It was designed particularly for aircraft production—with emphasis on light-weight, perfect balance and accurate control. It's a real precision tool for the most precise type of work—welding aluminum and other light-weight metals. Accurate flame control safeguards the metal against "burning." In speeding production, "Gasweld" AV-10 Aircraft Welding Torches are helping to hasten ultimate victory!

It will pay you to consider using this equipment in your plant. Write today for illustrated bulletin.

The AV-10 may be equipped to use standard tips by use of the No. WS-55-15 "standard head" as illustrated.

Weil Chemicals Division of

THE Liquid CARBONIC CORPORATION

3110 South Kedzie Avenue, Chicago 23, Illinois

BUFFALO, N. Y. • CINCINNATI, O. • CHICAGO, ILL. • DETROIT, MICH.
LOUISVILLE, KY. • MILWAUKEE, WIS. • ROCHESTER, N. Y. • TOLEDO, OHIO
CANADA: MONTREAL, QUEBEC • TORONTO, ONTARIO • WINDSOR, ONTARIO

GASWELD OFFERS A FULL LINE OF WELDING and CUTTING EQUIPMENT and SUPPLIES

Gasweld Machine Cutting Torches are available for use with any flame cutting machine.

Gasweld Pressure Regulators assure ample gas, even, constant pressure.

Gasweld cutting torches for "all-round" general purpose, give perfect results.

Gasweld Welding Torches handle either heavy welding or light jobs . . . quickly and efficiently.

IN ADDITION TO STANDARD EQUIPMENT, WE DESIGN AND MAKE SPECIAL EQUIPMENT FOR MANY PURPOSES

. . . because they alone have all these features:

1. T-slots in table tops for speedier set-up of all kinds of work.
2. 135-degree tilting range from horizontal.
3. Four rugged supports for greater steadiness.
4. Two Timken bearings on spindle shafts, instead of bushings, for permanent alignment of table top.
5. Double, instead of single, tilt gear (in 3-ton size and over) to equalize load for safety, steadier operation and longer life.
6. Motor and gearing housed inside frame to prevent damage during table loading.

Other features of the most complete line of Welding and Assembly Positioners — 100 lb. to 40,000 lb. capacity — are covered in Bulletin No. 210. Write today.

RS-14

Ransome

MACHINERY COMPANY
INDUSTRIAL DIVISION
DUNELLEN, NEW JERSEY
Subsidiary of **WORTHINGTON PUMP AND MACHINERY CORPORATION**

Budd Mfg. to Move Railway Car Shops

The Edward G. Budd Mfg. Co. has arranged to transfer its railway passenger car manufacturing division to a huge new plant in northeast Philadelphia. Tooling of the new plant will start immediately, and manufacturing of the first streamlined stainless-steel railway cars since 1941 will get underway in the fall. The company has contracts to build 59 stainless-steel railroad passenger coaches for operation between New York and Miami, cost of which will be in excess of $4,750,000.

» «

Universal Power Corp. Moves to New Quarters

Requiring larger quarters for its welding equipment manufacturing and distributing business, Universal Power Corp., Cleveland, recently moved its home office from 4900 Euclid Ave. to 735 Carnegie Ave. The new location permits additional space for manufacturing, warehousing and display rooms.

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New Distributorships

Ampco Metal, Inc., Milwaukee: Cameron & Barkley Co., Charleston, S. C., with Florida branches in Orlando, Miami, Jacksonville and Tampa, for the state of Florida; Delta Oxygen Co., Memphis, Tenn., for parts of four states covering western Tennessee and Kentucky, northern half of Mississippi and northeast Arkansas; Louisiana Welding Supply Co., Baton Rouge, La., for south central Louisiana; Mobile Welding Supply Co., Mobile, Ala., for the northwest tip of Florida, the south half of Alabama and several counties in southeastern Mississippi.

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Metal & Thermit Corp., New York City, distributors for Murex electrodes: Acme Welding Supply Co., Fargo, N. D.; Alhambra Repair & Machine Shop, 1315-30th St., Sacramento, Calif.; J. D. Hopper Welding Supplies, 1500 S. Main St., Anderson, Ind.; Industrial Gas Distributors, 1916 Vermont Ave., Toledo 2, O.; Kirk-Wiklund & Co., 1704 Baltimore Ave., Kansas City 8, Mo.; Randall-Ebner Co., 316 Jay St., LaCrosse, Wisc.; Welding Equipment & Mill Supply Co., Galion, O.

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Mir-O-Col Alloy Co., Los Angeles: Acetylene Products Co., Indianapolis; Baker Transfer & Storage Co., Bakersfield, Calif.: Cragin Co., Seattle, Wash.; Pacific Metals Co., Inc., San Francisco Bay area and Los Angeles; Renfro Products Co., Los Angeles; St. Johns Welder's Supplies Co., Portland, Ore.; Union Supply Co., Denver.

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Wilson Welder and Metals Co., Inc., New York City: Graybar Electric Co., exclusive distributor for Wilson electrodes in the areas served by Graybar's Cincinnati, Pittsburgh and Cleveland offices.